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Typhoid Vaccine Studies*

Investigation of Virulence and Antigenic Properties of Selected Strains of the Typhoid Organism

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THE use of typhoid vaccine for individual prophylaxis was first introduced into the United States on a large scale by General F. F. Russell, of the U. S. Army. The preliminary studies were made by him at the Army Medical School, in Washington, D. C., and, after thorough investigation of such work in England and Germany, production of vaccine was begun in 1908. The following year vaccination was commenced in the Army as a voluntary measure; it became applicable to all military personnel in 1912.

The strain of the typhoid bacillus selected for the preparation of the vaccine was the well known Rawlings strain isolated by Wright in 1900 and used by Leishman for the preparation of the British Army vaccine. The original technic of preparation here combined the German saline suspension of agar cultures with the British method of counting, of killing at a relatively low temperature, and of preserving with cresol. Although minor changes have been made occasionally, the technical procedures have remained essentially the same throughout the years. The Rawlings strain is still in use.

From time to time suggestions have been made to the effect that a change in technic, such as: that the use of formalin for killing and preserving would reduce reactions and preserve the original antigenic qualities of the vaccine, or that the use of a different strain—a freshly isolated strain, or several strains—of the typhoid bacillus would improve the immunizing potency of the vaccine. Such suggestions have always received serious consideration, as evidenced by the recent thorough discussion of the subject by Hawley and Simmons.

That the vaccine as it has been prepared, using the Rawlings strain, is efficiently immunogenic has been amply demonstrated by the trend of typhoid fever in the U. S. Army and the U. S.

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Navy following its introduction as a preventive measure. With the record achieved, it is obvious that any change in the method of preparation of the vaccine or in the strain of bacillus used must await thorough study of all factors involved. Before any modification can be considered seriously there must be ample proof, gained by a dependable method, that through it the vaccine will be no less protective than it has been in the past. The development and production of the Army typhoid vaccine is a major function of the Army Medical School. It is, therefore, in conformity with this duty that the investigations now under way were undertaken. They relate to studies of selected strains of the typhoid bacillus, the purpose in view being the utilization of all recent developments in bacteriology and in immunology to determine when, and how, it may eventually be practicable to improve still further the protective qualities of the typhoid vaccine prepared for and used by the Army, Navy, and other government bureaus as a protective measure.

Great credit must be given to Grinnell for his originality in applying to the direct evaluation of virulence and immunogenic potency of vaccine strains a method which has been at our disposal for many years. He used the intraperitoneal injection of mice to study the relation of the killing power of various strains of the typhoid bacillus to their immunizing activity, and correlated these factors with their colonial and antigenic structural characteristics. In this work he brought together and used to a practical end those recent developments in the study of bacteriology which might otherwise have remained nothing more than intensely interesting and possibly controversial research phenomena. The result of Grinnell's work is that we now have an experimental method which may give us an approach to the standardization of typhoid vaccine.

THE STRAINS OF EBERTHELLA TYPHOSA CONCERNED

From the numerous strains available 7 were finally selected for this work. Each of them is representative of the group to which it belongs; together they include the types of typhoid bacilli most under discussion at present.

1(I)

This is the Army Medical School culture of the English Rawlings strain which was brought to the United States by General F. F. Russell in 1908. Since 1910, it has been used in the preparation of typhoid vaccine at the Army Medical School. Subsequent to the observations of Arkwright it has been considered an intermediate form, being neither completely rough nor typically smooth. The colonies grow rapidly, are round or nearly so, with smooth edges sloping upward to a slightly raised center. Under 5X magnification colonies have a slightly roughened appearance. In consistency, they are moist and homogeneous. When grown in broth a uniform turbidity is produced; the growth on agar is easily made into a stable uniform suspension in saline. It is actively motile. The majority of the bacilli are of average size with the variations usually seen in old stock cultures—individuals vary from short, almost coccal or oval to long, curved forms.

The average lethal dose* (a.l.d.) for mice is approximately 400 million organisms in Ringer's solution suspension. In mucin suspension the m.l.d. is approximately 100 million in Swiss mice.

1(R)

This is a typical rough variant of 1(I) obtained from the agar transplant

* Average lethal dose (a.l.d.) is defined as the number of bacilli which have been found to kill 50 per cent of the mice injected; m.l.d. is that which kills 100 per cent. In this work mature, white mice weighing 18 to 20 gm. have been used. The observation period is up to and including 72 hours.

of a 17 day old infusion broth culture of the latter. The colonies are rapidly growing, flattened, with irregular margins, and roughened surfaces. In consistency, they are dry and granular. Growth in broth is luxuriant, with pellicle formation and sedimentation, the intervening medium being clear or only slightly clouded. While growth on agar is abundant, a uniformly turbid suspension of it in saline is made only with difficulty. The suspension agglutinates spontaneously forming flakes of varying size. In hanging drop the bacilli are seen to be actively motile; stained preparations show atypical forms, many of them being large, thick, curved rods. The young organisms, while typical bacilli in form, are larger than those of the same age of the parent strain.

The a.l.d. for mice is approximately 400 million organisms in Ringer's solution suspension.

1(s)

A typical smooth form of 1(I) obtained from the agar transplant of a 17 day old infusion broth culture of the parent organism (isolated in 1931). The colonies grow slowly and are considerably smaller than 1(I) colonies. They are round, with even margins and smooth surfaces, characterized by a heaped center giving the colony the geometrical appearance of a half-sphere. In consistency they are moist and homogeneous. Growth in broth produces uniform turbidity, and the growth on agar is easily suspended in saline. The bacilli are actively motile; in stained smears they are indistinguishable from those of the parent culture.

The a.l.d. for mice is approximately 400 million organisms in Ringer's solution suspension.

53

Isolated from the blood of a mild case of typhoid fever, at Walter Reed General Hospital, in May, 1932. The blood serum of the patient contained both flagellar and somatic agglutinins. Colonies are round, of medium size, have raised centers, and slightly irregular margins from which ridges begin, converging to the center. The consistency of the colonies is moist and homogeneous. This strain produces uniform turbidity in broth; the growth on agar is easily suspended in saline. It is actively motile; there is nothing characteristic on a stained film.

The a.l.d. for mice is approximately 300 million organisms in Ringer's fluid suspension.

36

Isolated in October, 1933, from the blood of a patient at Walter Reed General Hospital. Clinically a very toxic type of infection. No flagellar and little if any somatic agglutinins could be demonstrated in the patient's serum. Moreover, the latter failed to agglutinate this organism. It was an O inagglutinable strain.

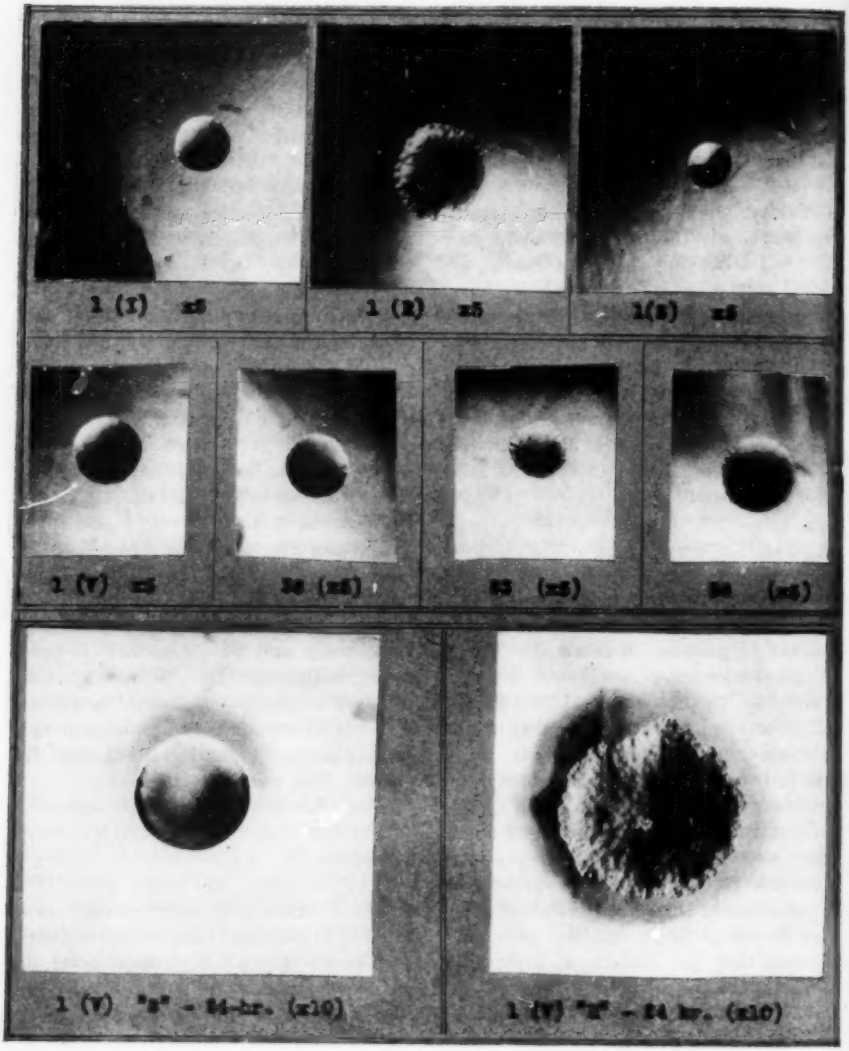
Colonies are round and dome-shaped, with smooth margins and surfaces, of medium size, and characterized by a translucent brownish center. Consistency, moist and homogeneous. It produces uniform turbidity in broth; growth on agar is easily suspended in saline. The bacilli are actively motile, and the individuals are of uniform, but slightly smaller than average size.

The a.l.d. for mice is approximately 75 million organisms in Ringer's fluid suspension.

58

The "Panama Carrier Strain," isolated in September, 1934, from the feces of a carrier (attack of typhoid fever in 1913) in Panama, by Dr. L. B. Bates. The colonies are larger than average, round, with sides sloping gradually to raised, flat centers; the margins are slightly crinkled; the consistency is moist and homogeneous. Growth in broth produces uniform turbidity; growth on agar is easily suspended in saline. The bacilli are actively motile;

TYPICAL COLONIES OF STRAINS OF E. TYPHOSA USED IN THIS WORK



NOTE: Colonies in upper block, 1(I) to 58, 18 hours old.

a stained preparation shows them to be small, short rods, uniform in size.

The a.l.d. for mice is approximately 100 million organisms in Ringer's solution suspension. In mucin suspension the m.l.d. is 100 bacilli, in Swiss mice.

1(v)

Rawlings-Bensted. A rejuvenated (by mouse-passage) race of the Rawlings strain, obtained from Colonel Perry of the R.A.M.C., Netley, England, in October, 1934. The colonies produced by this culture grow rapidly, they are large, round, and perfectly smooth. Growth in broth produces uniform turbidity; the moist and homogeneous growth on agar is easily made into a uniform and stable suspension in saline. The bacilli are actively motile, although non-motile colonies have been encountered in this study. A stained preparation shows them to be small rods, uniform in size.

The a.l.d. for mice is approximately 75 million organisms in Ringer's solution suspension.

PRESERVATION OF STRAINS

In order that strains shall remain without change, at least, until the completion of these studies, special measures have been taken to provide against the differences likely to occur in routine cultivation. In January of this year, prior to the commencement of the virulence tests, each strain was frozen and dried by the method of Flosdorf and Mudd. The growth from agar cultures after suspension in veal infusion, peptone broth (pH 7.4) was distributed into sterile, pyrex ampules. The am-

TABLE I

PRELIMINARY TOXICITY TEST

JAN. 23, 1935

		Dose in Millions of Organisms								
Strains	*Time Period*	*50*	*100*	*200*	*400*	*600*	*800*	*1,000*	*1,200*	*1,400*
1(I)	24-hr.			1/5	2/5	3/5	4/5	5/5		
	48-hr.			nc	nc	nc	1/5			
	72-hr.			nc	nc	nc				
	Total			1/5	2/5	3/5	5/5	5/5		
1(S)	24-hr.			0/5	3/5	5/5	5/5	4/5		
	48-hr			nc	nc			1/5		
	72-hr.			nc	nc					
	Total			0/5	3/5	5/5	5/5	5/5		
53	24-hr			2/5	5/5	5/5	5/5	4/5		
	48-hr.			1/5				1/5		
	72-hr			nc						
	Total			3/5	5/5	5/5	5/5	5/5		
1(R)	24-hr.					1/5	3/5	5/5	5/5	5/5
	48-hr.					nc	1/5			
	72-hr.					nc	nc			
	Total					1/5	4/5	5/5	5/5	5/5
36	24-hr.	1/5	4/5	5/5	4/5	4/5				
	48-hr.	nc	1/5		(*)	nc				
	72-hr.	nc				1/5				
	Total	1/5	5/5	5/5	4/5	5/5				
58	24-hr.	3/5	3/5	4/5	5/5	4/5				
	48-hr.	2/5	1/5	1/5		(*)				
	72-hr.		nc							
	Total	5/5	4/5	5/5	5/5	4/5				
1(V)	24-hr.	1/5	4/5	4/5	5/5	5/5				
	48-hr	2/5	1/5	1/5						
	72-hr.	nc								
	Total	3/5	5/5	5/5	5/5	5/5				

Explanation: Denominator represents number of mice injected; numerator indicates number of mice dead within respective period: "nc" denotes no change; (*) signifies one mouse missing from cage.

pules were immersed in alcohol chilled to about −78° C. by means of CO_2 snow, then they were attached to the manifold and suction applied by means of a vacuum pump. Drying of the suspension was effected without thawing. After 5 to 6 hours, during which time a high vacuum was maintained, the ampules were sealed off in a blow pipe flame—without breaking the vacuum. They were stored in a refrigerator whose temperature is about 5.0° C. Up to the present no change of any kind has been detected in the strains preserved in this way.

TESTS FOR TOXICITY OR VIRULENCE

These tests were carefully planned in order that the bacteria of the various strains would be of the same age at the time of their injection. This required the coöperation of the entire technical staff of the Army Medical School. To insure thorough understanding on the part of everyone a "dry run" was enacted the day before the first series of tests was made.

The cultures, grown exactly as for the production of typhoid vaccine, were suspended in buffered Ringer's solution when they were from 18 to 20 hours old. The suspensions were then counted in a Helber counting chamber; the average of at least 3 counts was considered as giving the greatest accuracy obtainable.

The suspensions were then diluted to the desired strength with buffered Ringer's solution. The dose for a mouse was adjusted so that in every instance it was contained in 0.5 c.c. of fluid. This amount was injected intraperitoneally, the skin of the mouse being first touched by a cotton swab moistened with alcohol. Tuberculin syringes of 1.0 c.c. capacity were used; these carried a ⅝" −25 gauge needle. Great care was taken to see that the injected mice were properly fed and watered.

Two sets of tests were made—a preliminary and a final. In the preliminary test, lots of 5 mice each received the same dose. Five different doses were injected for each strain. The information desired was the a.l.d. for each strain. This is the number of bacilli which will kill 50 per cent of the mice. Table I shows the results of the preliminary tests.

The information gained was used in estimating the range of dosage for the final tests. In this, 5 different amounts were injected. The amounts were adjusted so that the a.l.d. might fall at the middle dose. For the lowest and the highest doses 10 mice were injected and 30 for each of the 3 intermediate doses. The counting and method of injecting were identical with those of the preliminary tests. The results are shown in Table II.

VACCINE PROTECTION TESTS

Having determined the a.l.d. for each of the 7 strains the next point was to use this information to determine the relative protective value of vaccines made from them. The tests were planned so that the protective potency of the vaccine of each strain would be ascertained not only for itself but for each one of the other strains. In other words, cross-protection tests were made in all directions. Furthermore, the extent of the protection was ascertained by testing against not only one, but also against multiples of the a.l.d. In this, as in the virulence tests, there were a preliminary and a final series of tests.

The vaccines were made exactly as the regular typhoid vaccine is made, routinely, in the Army Medical School. They were standardized so that the first dose was 100 million, the second and the third 200 million typhoid bacilli. These amounts were contained in 0.25 c.c. of the vaccine. Injections were made intraperitoneally at weekly intervals. Two weeks subsequent to the final dose the test injections were given as in the virulence tests. The results of the prelim-

TABLE II

FINAL TOXICITY TEST

JAN. 31, 1935

Strain of E. typhosa	Time Period	Dose in Millions of Organisms									
		12.5	25	50	100	200	400	600	800	1,000	1,200
1(I)	24-hr.					0/10	1/30	7/30	8/30	9/10	
	48-hr.					nc	nc	nc	6/30	1/10	
	72-hr.					nc	nc	nc	nc		
	Total					0/10	1/30	7/30	14/30	10/10	
1(R)	24-hr.						5/10	27/30	27/30	29/30	10/10
	48-hr.						1/10	nc	1/30	nc	nc
	72-hr.						nc	nc	nc	nc	nc
	Total						6/10	27/30	28/30	29/30	10/10
1(S)	24-hr.				0/10	6/30	10/30	27/30	8/10		
	48-hr.				nc	2/30	8/30	nc	1/10		
	72-hr.				nc	nc	1/30	nc	nc		
	Total				0/10	8/30	19/30	27/30	9/10		
53	24-hr.			0/10	2/30	6/30	25/30	8/10			
	48-hr.			nc	1/30	nc	2/30	2/10			
	72-hr.			nc	nc	nc	nc	nc			
	Total			0/10	3/30	6/30	27/30	10/10			
36	24-hr.	1/10	4/30	7/30	25/30	10/10					
	48-hr.	nc	4/30	1/30	3/30	nc					
	72-hr.	nc	nc	nc	nc	nc					
	Total	1/10	8/30	8/30	28/30	10/10					
58	24-hr.	0/10	1/30	4/30	20/30	8/10					
	48-hr.	nc	1/30	1/30	3/30	1/10					
	72-hr.	nc	nc	nc	nc	nc					
	Total	0/10	2/30	5/30	23/30	9/10					
1(V)	24-hr.	0/10	10/30	15/30	25/30	10/10					
	48-hr.	nc	4/30	8/30	nc	nc					
	72-hr.	nc	nc	nc	nc	nc					
	Total	0/10	14/30	23/30	25/30	10/10					

Explanation: Denominator represents number of mice injected; numerator expresses number of mice dead within indicated period; "nc" denotes no change.

inary immunization test are shown in Table III.

This may be considered a satisfactory result. The first dose for each strain in the protection test was estimated to be one-half the a.l.d. In other words, it was the intention to have for each group of 5 vaccinated mice an amount below that expected to kill more than 2 of them. That things did not turn out exactly according to the plan is merely one more illustration of the wide limits of accuracy, resulting from several uncontrollable factors, attainable in such work. On the other hand, a high percentage of the control mice died and a high percentage of the vaccinated mice lived. Furthermore, the indication is clear that vaccines made from strains 58, 36, and 1(V) afforded better protection than did the others.

Another interesting factor suggested by this series is that mice which received living bacilli belonging to strains 1(I), 1(R), 1(S), and 53 were not protected so well as those which received as their test dose bacilli of strains 36, 58, and 1(V). One explanation for this is immediately apparent when we note the enormous numbers of bacilli it was necessary to inject when testing with members of the avirulent group.

The information gained from careful study and discussion of these preliminary cross-immunity tests was used in planning the final one. In this the conditions were identical with those of former tests. Planting of cultures on the day prior to the injection of the test doses of living organisms, was so timed as to make the whole chronological set-up uniform. The injections were

TABLE III

TEST FOR IMMUNITY AND CROSS IMMUNITY

MARCH 14, 1935

Injections of Live Organisms		*Percentage of Deaths Among Lots of Five Mice, Each Lot Immunized, Respectively, with the Following Vaccines 14 Days Previously*							
Strain	*Numbers (in millions)*	*1(I)*	*1(R)*	*1(S)*	*36*	*53*	*58*	*1(V)*	*None—Normal Controls*
1(I)	800	40	0	0	0	20	20	0	100
	1,600	100	80	60	100	100	20	60	100
	3,200	80	100	100	100	100	80	100	100
	6,400	100	100	100	100	100	100	100	100
	12,800	100	80	100	100	100	100	100	100
1(R)	500	20	0	0	0	0	0	0	80
	1,000	20	40	60	20	40	0	40	100
	2,000	100	80	100	80	100	100	100	100
	4,000	80	80	100	80	100	80	80	100
	8,000	100	100	100	100	100	100	100	100
1(S)	400	0	0	0	0	0	0	0	20
	800	0	20	0	0	0	20	0	100
	1,600	40	60	40	80	60	40	40	100
	3,200	80	100	100	100	100	80	80	100
	6,400	100	100	100	80	100	100	100	100
36	75	20	0	20	0	0	0	0	20
	150	0	0	20	0	20	0	0	100
	300	80	80	80	20	80	0	0	100
	600	100	60	100	20	100	0	0	100
	1,200	100	100	100	80	80	0	60	100
53	300	0	0	20	0	0	20	0	40
	600	0	20	20	0	0	0	0	100
	1,200	80	80	60	80	100	60	60	100
	2,400	100	60	80	100	80	80	80	80
	4,800	100	100	100	80	100	100	100	100
58	75	20	0	0	0	40	0	0	0
	150	60	0	20	0	20	0	0	60
	300	80	60	80	20	40	0	0	100
	600	80	80	100	0	60	0	0	100
	1,200	100	100	100	60	100	20	40	100
1(V)	25	0	0	0	0	40	0	0	20
	50	40	0	40	0	0	0	0	20
	100	60	20	60	0	40	0	0	100
	200	80	60	80	0	60	0	0	100
	400	100	80	80	20	60	0	20	100

90.5% of the deaths among the vaccinated mice occurred during the first 24 hrs.
9.5% . . . . . 2nd 24 hrs.
97.7% of the deaths among the normal mice occurred during the first 24 hrs.
The remainder, or 2.3% were dead at the end of 48 hours.

made by a uniform technic, and the mice were cared for subsequently as were those of the previous lots. The total number of mice used in this series was 6,200, and they were all injected between 8:00 A.M. and 3:00 P.M. The results are shown in Table IV.

Examination of this table gives in probably a more satisfactory and conclusive manner the same information as that gained from the preliminary cross-protection tests. The death rate among the controls was closer to the ideal. In the case of 58 and 1(V) the results might have been even more convincing if the dosage had been somewhat higher.

It is quite clear that we are dealing with two different groups of strains so far as virulence is concerned. In the tests with living bacilli of the relatively avirulent group it appears that the dosage was so high that differences in protective value of the vaccines were almost obliterated. When we examine the results among the groups which received as their test doses bacilli of the

TABLE IV

FINAL IMMUNIZATION TEST

MARCH 27, 1935–APRIL 24, 1935

Injections of Live Organisms		Percentage of Deaths Among Lots of Mice, Each Lot Immunized, Respectively, with the Following Vaccines 14 Days Previously							
Strain	Numbers (in millions)	1(I)	1(R)	1(S)	36	53	58	1(V)	Controls
1(I)	400	0	0	20	0	0	0	0	40
	800	16	13	13	10	3	4	10	80
	1,600	67	60	69	63	82	53	79	100
	3,200	96	96	96	86	96	100	86	100
	6,400	90	80	100	90	100	90	100	100
1(R)	400	0	0	0	0	0	0	0	20
	800	10	0	16	10	20	3	16	80
	1,600	56	43	30	43	79	30	67	100
	3,200	82	82	92	97	100	90	92	100
	6,400	90	90	90	100	100	80	100	100
1(S)	400	0	10	0	0	0	10	0	20
	800	43	36	36	20	46	14	13	80
	1,600	79	82	79	36	89	63	89	100
	3,200	96	89	100	100	96	82	96	100
	6,400	100	90	90	90	100	100	100	100
36	75	0	10	0	0	0	0	0	40
	150	43	0	33	0	30	0	0	100
	300	53	30	76	0	82	16	0	100
	600	92	86	79	0	92	3	3	100
	1,200	90	90	70	30	100	10	40	100
	2,400	90	100	100	50	100	80	70	100
53	300	0	10	0	0	10	0	0	0
	600	7	13	10	0	7	7	7	60
	1,200	60	76	56	3	53	30	20	100
	2,400	86	92	86	92	92	82	86	100
	4,800	100	100	90	80	100	100	90	100
58	75	0	0	0	0	10	0	0	20
	150	7	0	10	0	0	0	0	40
	300	10	3	43	0	13	0	0	80
	600	46	13	60	0	82	0	0	80
	1,200	80	50	80	0	90	10	20	100
	2,400	100	90	80	10	100	0	20	100
1(V)	25	20	0	10	0	10	0	0	0
	50	10	0	13	0	10	0	0	0
	100	13	3	26	0	20	3	0	0
	200	36	16	30	3	56	0	0	20
	400	60	40	60	0	40	0	0	80
	800	100	100	100	30	100	0	20	100

more virulent strains, however, wide differences in the protective value of the vaccines are apparent. Here again the strains are clearly grouped. The strains 36, 58, and 1(V) are more efficiently immunogenic than are 1(I), 1(R), 1(S), and 53.

DISCUSSION

In such work as this one is constantly seeking to differentiate between toxicity and virulence and between these terms and invasiveness. The last, it is believed, should be restricted to cases in which the animal species concerned is susceptible to natural infection by the organism concerned; to cases in which, by some means, the microörganism gains access to the tissue for which it has a special predilection and develops there eventually causing morbidity and possibly mortality. The sickness most frequently exhibits a characteristic clinical picture. The type of clinical syndrome usually depends upon the characteristic metabolic products of the infectious process.

It is not so easy to separate virulence from toxicity. In any case, toxicity is not a good word to be employed in so vague a manner. Ehrlich defined the

word toxin so clearly and definitely that its use in any other sense is really not admissible. The trouble is that we have no other term to express the idea here. In the injection of enormous doses of relatively avirulent typhoid bacilli we have almost overwhelmed the mice by a mass of noxious or "toxic" material which gives their acquired vaccinogenic immunity no chance to demonstrate its existence. The differences in immunity which we do discover are the result of combinations of noxiousness or "toxicity" and virulence in which the former is not sufficient to overwhelm the animal. On the other hand, it acts somewhat like an "aggressin" and prepares the mouse for a result dependent upon whatever virulence the particular strain of relatively avirulent bacilli may have.

CONCLUSIONS

There seems to be some indication in these results that immunogenic properties of typhoid organisms are associated with their virulence. The virulent organisms used in this experiment, when used as a heat-killed tricresol preserved vaccine in the number of mice tested, gave better protection than that afforded by the avirulent group under similar circumstances.

Laws, Dealer's Insurance

. . . Instead of protesting against health legislation, the informed milk dealer is one of its most ardent advocates. Aside from his interest as a citizen, he is concerned in a selfish way with the maintenance of standards which will guard the milk supply from any suspicion of being a carrier of disease. Let him think for a moment what it would mean to him if an epidemic were traced to the milk supply of even some small unimportant peddler, to say nothing of what it would mean if one of the large milk concerns were implicated. Attach the stigma of milk-borne infection to even the smallest route and the whole milk industry in that area suffers. Orders are cancelled by the thousands and it is no easy task to convince frightened mothers that their children are safe if they drink the milk of a concern which is not involved in the outbreak. Why, health laws are the best insurance the milk trade can have!

. . . Most large milk distributors, for a purely selfish reason, leave nothing undone to safeguard the purity of their product. But sometimes the small concern or the producer-distributor might not be so careful since, having less investment in the business, he has less to lose and might be more willing to take a chance. Rigidly enforced milk regulations prevent him from taking that chance and thus serve as a safeguard not only to the public health but to every other farmer who produces milk in that area, and every other man who distributes it. There may be laws which seem to serve no worthy purpose but they are comparatively few in number and the burdens they inflict are offset a hundred times over by the value of the good ones. If public health authorities were to announce tomorrow that every regulation governing the sale of milk were to be removed, not 10 days would elapse before leading dealers would be attempting to do, voluntarily, what the laws now require them to do. The only difference is that they could not do the job half so well.—Editorial, *The Dairy Record*, Jan. 8, 1936.

Plumbing Hazard Survey of Pasteurization Plants*

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THE excellent study by the Chicago Health Department culminating in the definite determination of the cause of a striking epidemic of amebic dysentery, has caused many city health departments to become much more attentive to defective plumbing and its health significance. Although sanitary and public health engineers had for a number of years appreciated the dire potentialities of such defects, crystallized interest and demand for effective control were lacking until this epidemic forced the issue in a dramatic and thoroughly convincing manner. Many studies and surveys have been made of faulty plumbing by various agencies and, although complete reports are not available, apparently the studies have been largely confined to hotels and similar buildings, probably because the Chicago epidemic was centered in two hotels having faulty plumbing.

The author, in carrying out a preliminary survey of plumbing in buildings used for a number of purposes, included milk pasteurization plants. It is the purpose of this discussion to bring to attention the potential dangers of the contamination of milk from faulty plumbing in pasteurization plants.

* Read before the Public Health Engineering Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 10, 1935.

SCOPE AND PLAN OF SURVEY

This investigation was made possible through engineers provided by the professional FERA program. The program was planned on the basis of an investigation or demonstration as required by the FERA. The work was carried out in a systematic manner in order to discover all existing plumbing defects, and as accurately as possible the nature of such defects.

Graduate engineers, with few exceptions unfamiliar with sanitary engineering methods and technic, were available. Considerable time and effort were spent in training them by lectures, field inspections, and literature. Survey blanks for recording information were prepared and a system of standard sketches of piping systems was devised so that defects could also be shown and checked diagrammatically. In the beginning it was arranged that each investigator should spend ample time with an experienced man, so the details of the work were thoroughly understood. Weekly or more frequent conferences were held with all the men in attendance, at which points in question were thoroughly discussed. Upon the completion of a plant the investigators, working in pairs, prepared a written report covering the significant sanitary details. With these data available the work was completely field checked by the most competent and experienced man in direct charge of the work. Sam-

ples of the potable water supply were collected from several outlets in each building and analyzed bacteriologically.

Engineers making the surveys were allotted, in accordance with FERA regulations, a varying number of work days each month which obviously did not lead to maximum efficiency. Table I indicates the number of milk plants surveyed, time required, and cost of field work.

TABLE I

NUMBER OF MILK PLANTS SURVEYED, TIME REQUIRED, AND COST OF FIELD WORK

Milk Plant	*Per Cent Completed*	*Man Hours Required*	*Salary Cost*
A	100	114	118.56
B	100	54	56.16
C	100	60	62.40
D	100	36	37.44
E	100	36	37.44
F	60	306	318.24
Total 6		606	630.24

PASTEURIZATION PLANT EQUIPMENT

In order more readily to interpret the results of this survey, it is essential to discuss briefly milk plant equipment and plumbing requirements.

A modern milk plant is concerned with the processing of milk and milk products for the market. Pasteurized fluid milk and cream, butter milk, cultured milk, cheese, and ice cream constitute the principal end products. For the manufacture of these products various types of equipment are necessary, such as pasteurizers, coolers, holding vats, churns, condensers, refrigerators, compressors, brine tanks, bottle and can washers.

Large quantities of water are essential for washing, rinsing, cooling, the generation of steam for power, and sterilizing purposes. It is common practice to rinse equipment with water before milk or milk products are placed in contact with surfaces. Usually the initial cooling is accomplished with tap water and it is not uncommon for the shell or pipe wall separating this cooling medium from the milk to develop leaks. Frequently a product such as butter is washed direct in tap water. Cooling water is used over and over with the aid of roof aerators which are exposed to aerial contamination. Condensers are often employed for cooling the refrigerating medium with tap water, which is used repeatedly with the aid of aeration, or discharged to waste through a solid connection to the sewer. Toilet facilities are provided to maintain satisfactory personal hygiene. It is apparent that the quality and the quantity of the plant water supply are two important items in safe and effective operation.

Provision is made for the disposal of waste water from such plants by means of the usual system of sewer lines. The contents of these lines consist of the sewage from toilet rooms as well as large volumes of waste water from washing and rinsing machinery, floors, and other appurtenances. These sewers carry potentially infectious material and at times are probably overloaded to the extent of producing internal pressure.

RESULT OF SURVEY

The result of a survey of the plumbing and piping systems of 6 milk plants indicated a situation that was extremely complicated, especially in the large plants. The many types of equipment concerned, the frequent maze of pipes, and the various ways that this equipment was inter-connected with water and sewer lines, presented many difficulties in obtaining accurate information. To simplify and clarify the results of the survey the defects found have been grouped into 6 general types according to the way in which the condition becomes a plumbing defect and potential health hazard. "Plumbing defect" is used in a broad sense to include faults in piping systems as well as equipment design.

Type 1—Direct pipe connection between potable water supply and sewage or other contaminated water, with or without check or manual valve between, which through excessive back pressure or negative head, or both, might result in the contamination of the potable supply with sewage or polluted water. Example Type 1—Polluted water pump directly connected to potable water supply, condensers directly connected to potable water supply and also to sewer lines; drains or overflow from potable water tanks directly connected to sewer lines; mechanical refrigerating, units directly connected to potable water supply and sewer lines. Figure I illustrates this type of defect.

Type 2—Potable water supply inlets constantly submerged or submerged because of direct or indirect stoppage that, due to a negative head or vacuum in the potable water supply lines, might result in the contamination of the potable water supply with sewage or polluted water through back siphonage. Example Type 2—Constantly submerged inlets which are hazardous even when the fixtures are in good operating condition; such as siphon jets in water closets and urinal traps, laundry washing machines, processing tanks, water softeners, and stockwater basins. Inlets not ordinarily submerged beneath the surface of the fixture contents but which at times become submerged due to carelessness in filling or to stoppage of outlets; such as flushing rim openings in water closets, urinals, and slop sinks, lavatories, utility room sinks, drinking fountains, bottle washers, loose hose, etc. Figure I illustrates this type of defect.

Type 3—Sewer lines located over pasteurizers or other milk processing equipment; floor drains located in refrigerators or other rooms where food is stored or processed and in rooms where ice is made or prepared for use. Figure I illustrates this type of defect.

Type 4—Water supply subject to aerial pollution. Example Type 4—Potable water supply tanks with open or loose tops or covers located on roof of building or other exposed location.

Type 5—Possible infection of persons through use. Example of Type 5—Faultily designed drinking fountains which can be contaminated by user and result in a hazard to subsequent users.

Type 6—Equipment designed to hold food during processing, surrounded by or containing pipes or jacket through which the water supply is circulated. Frequently this type of equipment is rinsed with tap water just previous to use. The danger from such connections and operation is predicated upon the water supply becoming contaminated due to other faulty plumbing and the development of breaks in the pipes or jacket so that contaminated water would leak into the food supply. Example Type 6—Certain types of milk pasteurizers, milk holding vats, milk coolers, and other equipment in which dairy products are heated or cooled or both.

Based on this grouping of plumbing defects Table II indicates the number of plumbing defects in each milk plant. Table III indicates the extent to which equipment is involved in various types of plumbing defects.

The number of defective connections found and the extent to which equipment was involved varied greatly depending largely on the size of the plant. Tables IV and V indicating the survey data on 2 milk plants illustrate this wide variation.

TABLE II

NUMBER OF PLUMBING DEFECTS IN EACH MILK PLANT SURVEYED, CLASSIFIED ACCORDING TO TYPES

	Number of Plumbing Defects Found						
Milk Plant	*Type 1*	*Type 2*	*Type 3*	*Type 4*	*Type 5*	*Type 6*	*Total*
A	4	35	1	3	4	12	59
B	0	13	0	0	0	1	14
C	0	21	1	1	0	14	37
D	0	13	2	0	0	9	24
E	0	10	2	0	0	3	15
F	4	43	0	5	5	4	61
Total	8	135	6	9	9	43	210

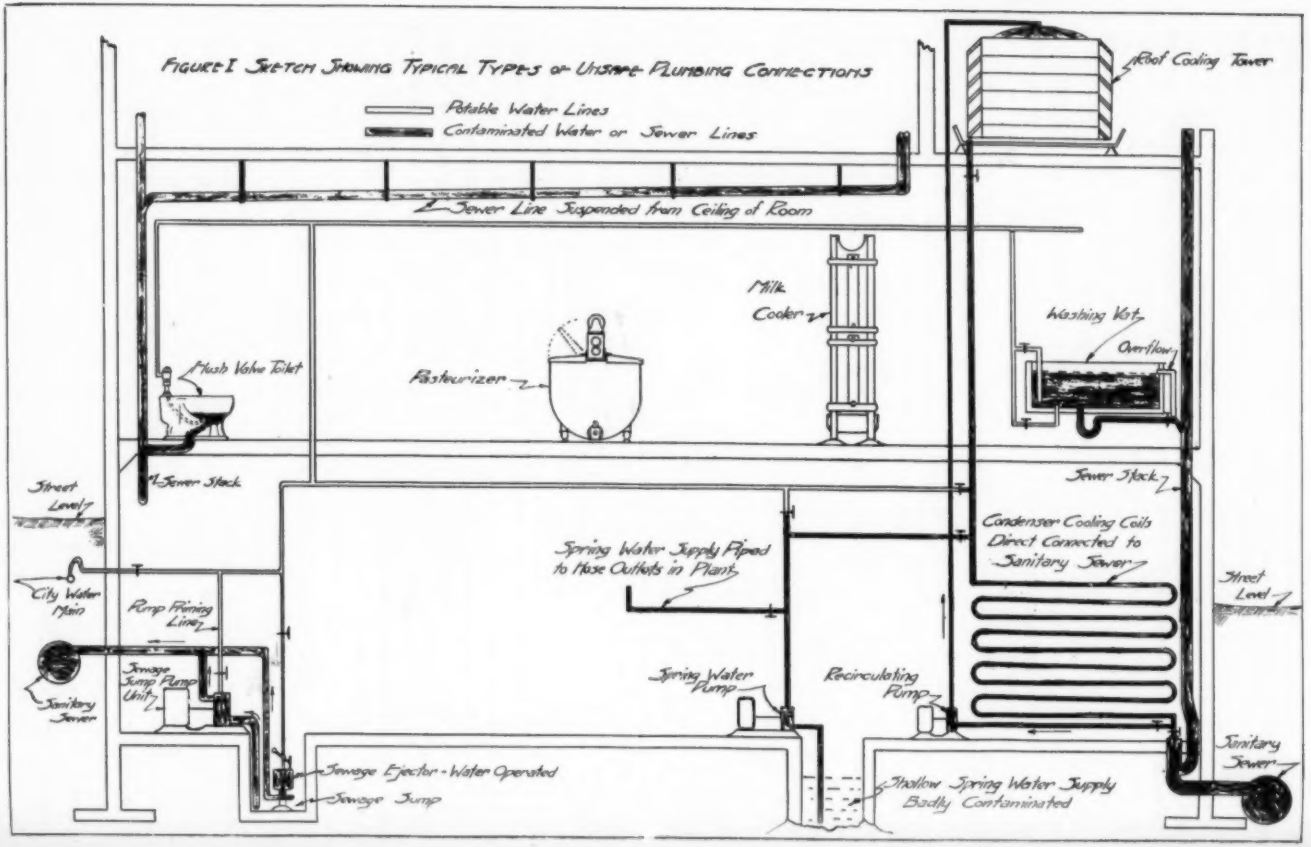
FIGURE I. SKETCH SHOWING TYPICAL TYPES OF UNSAFE PLUMBING CONNECTIONS
Potable Water Lines
Contaminated Water or Sewer Lines
Roof Cooling Tower
Sewer Line Suspended from Ceiling of Room
Milk Cooler
Washing Vat
Overflow
Flush Valve Toilet
Pasteurizer
Sewer Stack
Street Level
Sewer Stack
Condenser Cooling Coils Direct Connected to Sanitary Sewer
Spring Water Supply Piped to Hose Outlets in Plant
City Water Main
Pump Priming Line
Street Level
Sewage Sump Pump Unit
Sanitary Sewer
Spring Water Pump
Recirculating Pump
Sanitary Sewer
Sewage Ejector - Water Operated
Sewage Sump
Shallow Spring Water Supply Badly Contaminated

TABLE III

NUMBER OF PLUMBING DEFECTS IN MILK PLANTS CLASSIFIED ACCORDING TO TYPE AND EQUIPMENT INVOLVED

Equipment	Number of Plumbing Defects Found						
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Total
Bottle Sterilizer	..	2	..	..	..	..	2
Bottle Washer	..	4	..	..	..	..	4
Brine Tank	..	2	..	..	..	..	2
Can Washer	..	5	..	..	..	..	5
Case Washer	..	2	..	..	..	..	2
Cheese Tank	..	..	..	..	..	2	2
Condenser	..	2	..	..	..	..	2
Culture Tank	..	6	..	..	..	5	11
Drinking Fountain	..	5	..	..	9	..	14
Floor Drain	..	..	2	..	..	..	2
Flush Toilet	..	25	..	..	..	..	25
Hose	..	51	..	..	..	..	51
Laundry Washer	..	2	..	..	..	..	2
Milk Cooler	..	..	..	..	..	4	4
Milk Condenser	1	..	..	..	..	1	2
Milk Storage Tank	..	..	..	..	..	2	2
Pasteurizer	..	..	..	..	..	29	29
Potable Water Tank	..	..	..	7	..	..	7
Pump	5	..	..	..	..	..	5
Refrigerator	1	..	..	..	..	..	1
Roof Cooler	..	..	..	2	..	..	2
Sewer Pipe	1	..	4	..	..	..	5
Soaking Tank	..	1	..	..	..	..	1
Steam Cooker	..	4	..	..	..	..	4
Sterilizer	..	1	..	..	..	..	1
Wash Bowl	..	15	..	..	..	..	15
Wash Tank	..	7	..	..	..	..	7
Water Softener	..	1	..	..	..	..	1
Total	8	135	6	9	9	43	210

In 2 instances samples of water collected from milk plants showed heavy contamination. In 1 case, an auxiliary spring water supply, cross-connected with the city water supply and also used for cooling and flushing purposes within the plant, showed contamination. In the second instance the water sample was taken from a supply line to a milk cooler.

The survey of 6 milk plants showed the existence of 210 plumbing defects. There were 28 different kinds of milk plant equipment involved in the hazardous connections found. In 152 instances the plant water supply was subject to possible contamination. Forty-three pieces of equipment were found with water jackets or coils which in case of a leakage would allow the plant water supply to come into contact with the milk. In 137, or 65 per cent, of the defects found, back siphonage and in some cases stoppage of outlets, would be necessary to cause a hazard. Ten, or 4.8 per cent, of the defects resulted from direct connections, that is, solid piping without a break existing between contaminated water or sewage and the potable water supply.

DISCUSSION

It seems probable that the contamination of the milk plant water supply

TABLE IV

DEFECTIVE PLUMBING CONNECTIONS—DAIRY "B" SHOWING EQUIPMENT INVOLVED AND TYPE OF DEFECT

	Number of Plumbing Defects Found						
Equipment	*Type 1*	*Type 2*	*Type 3*	*Type 4*	*Type 5*	*Type 6*	*Total*
Loose Hose	..	8	..	..	..	..	8
Milk Storage Tank	..	..	..	..	..	1	1
Wash Bowl	..	5	..	..	..	..	5
Total	0	13	0	0	0	1	14

or some milk product may occur due to the various types of plumbing defects revealed by this survey. The frequency of such an occurrence cannot, however, be determined. The modern health officer is constantly seeking to provide more complete prevention against the contamination of foods. The public health importance of safely handling milk, during the vital process of pasteurization, is evident. Likewise, no effort should be spared to protect public water supplies from contamination.

As far as the more adequate protection of public milk supplies from filth-borne diseases is concerned, many city and state health departments and the U. S. Public Health Service have made notable progress, particularly in the last 10 years. Considerable effort and large sums of money are continually being expended to safeguard further the production of milk, its transportation, and processing by the distributors. It would appear that in our endeavor to improve upon pasteurization, cooling, and other equipment, as well as methods and supervision, the existing system of plumbing in milk plants, and certain details of milk equipment design, have been accepted as satisfactory without sufficient investigation.

It is recognized that at least a partial vacuum may exist without warning in any water piping system due to a number of causes such as a heavy draft in a

TABLE V

DEFECTIVE PLUMBING CONNECTIONS—DAIRY "F" SHOWING EQUIPMENT INVOLVED AND TYPE OF DEFECT

	Number of Plumbing Defects Found						
Equipment	*Type 1*	*Type 2*	*Type 3*	*Type 4*	*Type 5*	*Type 6*	*Total*
Can Washer	..	2	..	..	..	..	2
Drinking Fountain	..	5	..	..	5	..	10
Flush Toilet	..	25	..	..	..	..	25
Laundry Washer	..	2	..	..	..	..	2
Loose Hose	..	1	..	..	..	..	1
Milk Condenser	1	..	..	..	..	..	1
Pasteurizer	..	..	..	..	..	4	4
Potable Water Tank	..	..	..	5	..	..	5
Pump	2	..	..	..	..	..	2
Refrigerator	1	..	..	..	..	..	1
Steam Cooker	..	2	..	..	..	..	2
Wash Bowl	..	2	..	..	..	..	2
Wash Tank	..	4	..	..	..	..	4
Total	4	43	0	5	5	4	61

main due to a fire, or cutting off the water supply and draining lines for repairs. Such a vacuum has been shown to be capable of siphoning the contents of a flush valve type toilet bowl, in good working order, into the water supply line.

The usual method of protecting potable water lines directly connected to contaminated water or sewer lines against pressure on the non-potable water side from a pump, or back pressure due to the temporary stoppage of surcharging in a sewer line, has been by means of a check or manual valve. The ease and frequency with which such valves are made ineffective by corrosion, stoppage by foreign substances, or even tampering by the careless or uninformed, render their protection very uncertain. In general, these faults of piping or plumbing systems are responsible, in a great variety of modifications, for most of the existing potential hazardous plumbing conditions. The public health reasons for keeping sewage or human fecal material from contact with food or a potable water supply, are too well understood by health officials as well as the public, to require further discussion.

The results of this survey reveal a number of ways in which water supply, milk, and milk products in all the plants surveyed might be contaminated. If the water supply of the plant becomes contaminated with sewage because of one of the above reasons, there are many possibilities of this pollution coming in contact with milk due to leaks in coolers or pasteurizers. Whenever water is used in direct contact with milk products, such as butter, or rinsing surfaces of milk equipment, the danger is obvious. There is also the ever present danger of this contaminated plant water supply back-flowing into the distribution system. Additional examples of a hazardous situation in milk plants is the location of sewage lines directly over equipment used to process milk products, and the dangers due to leakage from joints or corroded pipes.

Many of these defects are obscure and require public health engineering training for their detection as well as rectification. It is a fact also that usually a sequence of unanticipated events must occur to make the potential defects an actual health hazard. This only emphasizes the difficulty of the problem since it creates an entirely false impression of safety.

Certain types of plumbing connections are more dangerous than others. Likewise the type and age of buildings, equipment, maintenance of equipment, and other factors, all have a bearing on the possibility of a health hazard occurring. Direct connections between a contaminated and potable plant water supply with excessive pressure on the contaminated side may be assumed as the most dangerous from the standpoint of possible frequency of occurrences. On the other hand, back-siphonage of the contents of flush toilets would usually be most dangerous from the standpoint of the greatest concentration of infection.

Old plumbing, badly corroded, and lacking many modern safeguards, as well as a poorly maintained piping system, present great potential hazards. Besides defective plumbing, this survey indicated that milk plant equipment is improperly designed in many cases, and may be responsible for contamination of the water supply or milk products.

In general, it is believed that the technical problems involved, and the financial outlay in new milk plant buildings, required to secure complete safety for such plants, would be relatively simple and not burdensome. In older buildings it would require expenditures dependent on the size and complexity of the plant. In the case of plumbing 20 to 25 years old, complete renovation is in order.

The administration of a program for the elimination of such defects presents much greater difficulties than the technical problems. Additional personnel must be thoroughly trained and competent. This will require an intensive training service, since few individuals have had experience with these problems. Careful detailed surveys will be necessary, and recommendations based on the findings must be accurate.

Plans for new plants must be carefully checked and approved before the construction contract for building or equipment is let, and field checked after installation to assure compliance. The work is very definitely a function of the health department and should be under the supervision of a competent public health engineer. When the existing plumbing inspection department is not under the jurisdiction of the health department, close coöperation is essential. The health department should not delegate the responsibility for assuring safe plumbing in milk plants to any other department, for the same reasons that the responsibility for proper milk pasteurizing and cooling equipment is not delegated to another agency.

CONCLUSIONS

A survey of plumbing in 6 milk plants, undertaken to determine whether any condition potentially hazardous to health existed, revealed the following:

1. A total of 210 plumbing defects were found involving 28 different kinds of milk plant equipment.
2. These faulty conditions are due to defective plumbing installations and fixtures, poor design of milk plant equipment, and inexperienced planning of the location and capacities of sewage systems within milk plant buildings.
3. These hazards to health should be eliminated, and in the future supervision of milk plant sanitation should include careful attention to plumbing as well as other features already watched with vigilance.
4. The problems presented by satisfactory control of milk plant plumbing offer no greater technical difficulties than have already been solved in the safe handling and processing of milk and milk products.
5. The responsibility for the administration of the program for correcting existing defects and prevention of future ones should rest with the health department.

COMING IN APRIL

SPECIAL BOOK NUMBER

Annual Review of Selected Books of Interest to Public Health Workers
and
Announcements of New Books

Eating Utensil Sanitation*

JAMES G. CUMMING, M.D., DR.P.H., AND N. E. YONGUE
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THE object in cleansing eating utensils should be not only cleanliness but also disinfection. It is well recognized that the infective organisms of the respiratory or saliva-borne infections are transferred in the nasal or mouth excretions by way of the air-borne route and by indirect contact through food, hand-to-mouth, or eating utensil transmission. Aside from the relative importance of these several avenues of infection distribution it should be pointed out that the saliva-borne infections as a group, including the pneumonias, tuberculosis, influenza, scarlet fever, measles, etc., are responsible either directly or indirectly for from 25 to 45 per cent of our mortality.

We have the pneumonias of infancy, the communicable diseases of children, tuberculosis of early and middle life, the resultant damaged heart and kidney of advanced middle life, and the pneumonias of the aged. If these as a group are to be brought under control, their avenues of distribution must be blocked, as were those for the typhoid group; in the latter case by public water purification and milk pasteurization. Basically there is no difference between the control of these two groups of disease. The same epidemiological principle applies to both: that the major avenue or avenues of spread must be continuously blocked in order to secure control leading to eradication. Such measures of control must be applied not only during an epidemic emergency, but they must be continuous and permanent. This continuous blocking process applies more particularly to the saliva-borne than to the typhoid group. In the latter group massive transmission means an explosive outbreak, while in the saliva-borne diseases, especially the pneumonias and tuberculosis, the distribution of infection is only potentially dangerous and does not immediately manifest itself.

Prior to the 1918 influenza-pneumonia epidemic, the respiratory group of diseases were regarded as air-borne, and practically all effort in their control was directed at the prevention of nose and mouth spray. It is, however, apparent that if the tubercle bacillus or the pneumococcus were present in the saliva this germ laden saliva could be passed from one person to another through inanimate objects by indirect contact, just as one transfers a culture from one test tube to another by a platinum loop. In short, outside the laboratory the eating utensil may do the work of the platinum loop.

It was in 1917, as a result of observations at Camp Tanforan, Calif., on the faulty methods of mess sanitation that the theory of eating utensil transmission was advanced.[1] This theory was supported by epidemiological and laboratory findings. In an epidemiological study of 66,076 troops it was shown that there was an influenza rate of 51.1 per 1,000 troops among those who had the advantage of

* Read before the Laboratory Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 7, 1935.

collective washing of utensils, while among those who washed their own mess gear in warm water the rate was 252 per 1,000.[2]

In a second field observation among 5,971 troops it was found that the use of boiling water for washing mess gear gave a protection of 85 per cent against the group of saliva-borne infections by blocking distribution through the 5 link chain of transmission.[3] An investigation in two large cities indicated that mechanical washing as contrasted with hand washing of dishes minimized mass indirect contact and afforded a protection of 80 per cent against influenza infection.[4]

Similarly, in public institutions having a population of 252,186 inmates, those protected against influenza by the machine washing of utensils had but one-third as many cases of influenza as those exposed through the hand washing of dishes.[5]

By laboratory procedures it was shown that 99 per cent of the organisms were removed by the machine method of washing, while but 78 per cent were removed by hand washing.[6] Furthermore, in the latter procedure, pathogenic organisms were isolated from both the wash water and from washed utensils.[7] These investigations included the transmission of tuberculosis from not only the wash water of spoons used by open cases in 35 per cent of the trials, but also from the washed spoons in 25 per cent of the trials.[8]

The joining of the 5 link chain of multiple indirect contact transmission was established by passage of *B. prodigiosis* from oral cavity of donor to that of recipient in 34 per cent of the trials.[9]

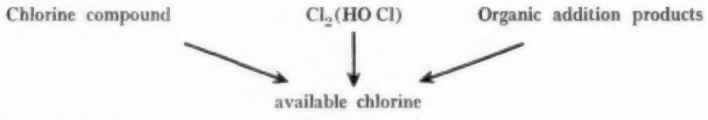
AVAILABILITY OF CHLORINE IN SOLUTION

During the last two decades the use of chlorine as a gas, as organic chlorine, and as hypochlorite, has found an extended field of usefulness as a disinfectant. Gaseous chlorine has been adapted to the disinfection of public water supplies and swimming pools. More recently, these preparations have been used to a limited extent for the disinfection of beverage glasses and tableware.

The action of chlorine in solution as a disinfectant is generally attributed to its formation of hypochlorous acid. This acid easily breaks down into hydrochloric acid and oxygen, thus being an oxidizing agent. The oxidizing action on bacteria is thought to be explanatory of the disinfectant properties.

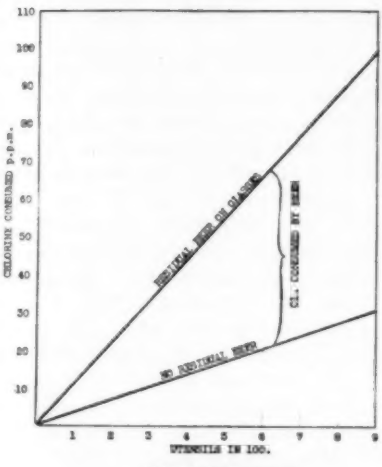
It is evident that the proper alkalinity of the solution for the production of hypochlorous acid is of great importance. This has been shown by Johns (Cf. *Scientific Agriculture*, 14:11, July, 1934) and others. Work must continue, however, to demonstrate the necessity of pH control at high concentrations under practical working conditions such as are maintained in the average restaurant.

The fact that the "available chlorine" does not truly represent the chlorine condition, and, therefore, the germicidal potency of a chlorine solution may be better illustrated by a diagram:



In dissolving chloramine T or a hypochlorite, the solution supposedly has available chlorine attached to the parent molecule, chlorine in solution, chlorine as hypochlorous acid, and cer-

CHART I.



WASHING OF BEER GLASSES
Showing consumption of chlorine by residual beer.

tain organic addition products. Ordinarily, we test these solutions by determining the available chlorine which must include chlorine from these various sources. It must be admitted in this connection that hypochlorites, especially sodium hypochlorite, releases all of its chlorine into solution much more readily than chloramine T. A simple experiment was performed to prove this statement. A solution of chloramine T and one of a hypochlorite were prepared, each having 200 parts of available chlorine. Each solution was diluted so as to render 0.3 to 1.0 part of free chlorine. The orthotolidine test was applied to each diluted solution, after adjusting the pH to barely the acid side—using the same amount of reagent in each test. After comparing the standards it was found that in the case of the hypochlorite the results from the orthotolidine test and the U.S.P. potassium-iodide-starch test were the same. While with the chloramine T the orthotolidine test gave about 20 per cent as much available chlorine as did the U.S.P. method. The situation is similar to hydrogen ion concentration and available acidity. Hypochlorites may be likened to highly ionizable acids. It would be expected therefore to obtain disinfectant properties at a lower available chlorine concentration from hypochlorites than from chloramine T.

For practical operation in the field, the available chlorine concentration at which we have a plentiful supply of hypochlorous acid and chlorine in solution is important, also, procedures which might influence the supply of these forms of chlorine in the disinfection of utensils become increasingly important.

In the laboratory the operations can be adjusted to the demands, but in the field practical conditions of oxidation must be provided to insure adequate disinfection.

CHEMICAL DISINFECTION

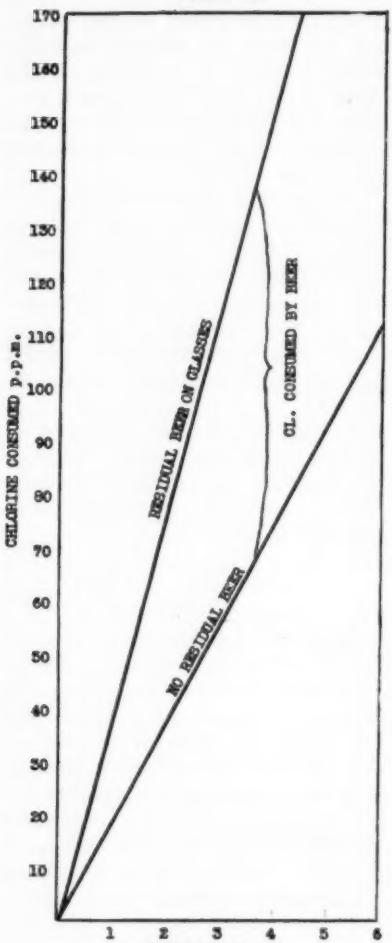
Glasses

While from a public health viewpoint the distribution of disease through beer glasses is of less importance than through eating utensils in public eating places, an extended investigation was carried out to determine, first, the chlorine consumption by residual beer carried directly into the disinfectant solution, and, second, the chlorine consumed by soapy solution carried over by the glasses into the disinfectant.

By the two compartment procedure the glasses with their residual beer were immersed in the chlorine solution for about 2 minutes. They were then rinsed in an overflow compartment of clear water. By this method about 10,000 glasses were treated during a 9 day test period, and hourly samples of the disinfectant were taken to determine the available chlorine. It was found that the chlorine consumed per glass was 0.11 p.p.m. of an organic chlorine preparation.

In contrast with the above experi-

CHART II.



WASHING OF BEER GLASSES
Showing consumption of chlorine by residual beer.

ment it was found that by using three compartments, in the first, rinsing the glasses in running water, thus removing the residual beer, the chlorine consumption per glass was but 0.034 p.p.m. as shown in Chart I. The residual beer with its organic content consumes about 3 times as much chlorine as when the glasses are previously rinsed.

The residual beer consumes more chlorine per utensil when inorganic chlorine preparations are used than with the organic compounds. In contrast to the above experiment in which chloramine T was used, it was found that the consumption of chlorine in the inorganic form as a result of the addition of residual beer was 0.384 p.p.m. per glass—more than 3 times as much—and that when the glasses were first rinsed the consumption was 0.188 p.p.m. per glass.

Here the importance of the addition of organic matter such as residual beer in the consumption of chlorine is shown. It is apparent that the operation must be closely supervised as to method as well as to the availability of chlorine in the disinfectant solution.

Tableware

In the washing and disinfection of tableware, it was found that the carry-over of residual soapy wash water on the dishes had a decided influence in increasing the consumption of chlorine.

A series of experiments were first run by the three compartment procedure. The first compartment contained soapy wash, the second a hypochlorite solution, and the third clear rinse water. About 3,000 dishes over a 5 day period were washed and disinfected by this method, and at hourly intervals the available chlorine was determined. The consumption of chlorine per utensil was 0.208 p.p.m. or about 20 p.p.m. per hour (Chart III).

In contrast to the above consumption of chlorine, it was found, in a series of tests in which 17,000 dishes were washed and disinfected by the four compartment method which included a rinse of the soapy dishes before immersion in a hypochlorite solution, that the chlorine was consumed at the rate

of only 0.075 p.p.m. per utensil or 10.6 p.p.m. per hour. It will be noted that the organic fatty acids of the soap consumed 0.133 p.p.m. of inorganic chlorine per utensil washed and when not removed by the rinsing process over two times more chlorine was consumed.

In other words, if one were to start with 100 p.p.m., and the residual soapy water on the dishes were added to the chlorine solution, all the chlorine would be consumed in 5 hours; while if the soapy dishes are subjected to a rinse, the disinfectant solution would last 10 hours. Similarly, on the basis of a 100 p.p.m. of available chlorine twice the volume of the solution is needed to meet the requirement when residual soapy water is added.

FIELD BACTERIOLOGICAL INVESTIGATIONS

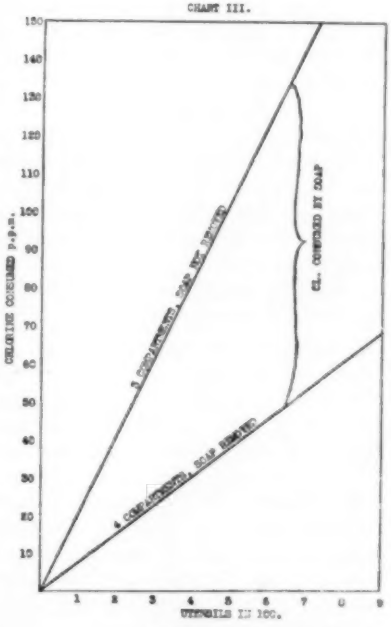
As in our original investigation of the transmission of the saliva-borne diseases, in this work the spoon was used as the bacteriological test utensil. It actually enters the mouth of both donor and recipient, and, because of its large exposed surface area, carries more oral bacteria in the mucus adhering to it than any other utensil. Furthermore, its bacterial load can be determined more easily than that of other utensils. This can be readily done by placing 10 spoons in a pint jar containing 200 c.c. of sterile salt solution immersing only the bowls, shaking for 3 minutes, after which by the plate method the number of bacteria per spoon may be determined. This multiple spoon test for determining cleanliness and disinfection as a standard for all table utensils is simple, accurate, and dependable.

But there is another test of equal importance—it is the bacterial count per c.c. of the wash waters. A soapy solution may remove grease and visible dirt, but at the same time the washing of successive dishes adds to the bacterial count of the wash water until finally the contamination runs so high that the utensils may carry more organisms after, than before they were washed. And then too, when the wash water is heavily contaminated the hands of the operator carry a heavy load of bacteria, and this constitutes a hazard, not only to the operator but to the public as well, for the operator is frequently employed also in the preparation of food.

We then have two control factors: the multiple spoon test, as well as the test of the wash water. Both are important as regulatory factors for the protection of public health. While the work here reported is not final the aim has been toward developing a practical procedure of dish washing which would satisfy the bacterial tests for both the utensils and the wash water.

A number of different procedures were used and while utensils could be

CHART III.



HAND WASHING OF TABLEWARE
Showing consumption of chlorine by residual soap on dishes.

TABLE I

Hours	Soapy Wash Bact. per c.c.	Soapy Rinse Bact. per c.c.	Chlorine Available	Spoons Bact. per Spoon
1st	12,000	8,000	184.3	0
2nd	50,000	20,000	166.6	0
3rd	100,000	60,000	141.8	2
4th	120,000	100,000	88.6	0
5th	250,000	100,000	53.1	2

produced with a satisfactorily low count, the stumbling block to the operations was the high count in the soapy wash water. For instance, as shown in Table I, during a 5 hour run by the four compartment method, the bacterial count of the soapy wash water in compartment 1 at the start was 12,000 per c.c. and at the end 250,000 per c.c. The count of the soapy rinse water in compartment 2 used to free the utensils of soap before immersion in chlorine rose from 8,000 bacteria per c.c. to 100,000 per c.c. The exposure of the utensils in 3, the chlorine compartment, was 5 to 7 minutes. The available chlorine in this run was 185 p.p.m. at the start and 53 at the finish. The object of the clear water rinse compartment 4 is to free the utensils of chlorine odor and taste. This is necessary when the dishes are immediately used after washing, but only when the inorganic compounds are used. By the multiple spoon test the utensils appeared to be satisfactorily disinfected; viable organisms having been found at the end of the 3rd and 5th hours only.

As far as the disinfection of utensils by the multiple spoon test is concerned, Table I presents almost perfect results, but the soapy and rinse waters are highly polluted, a hazard to the public through the operator, who not only washes the dishes but prepares food.

In order to meet the requirement of low bacterial counts in the soapy wash water it was chlorinated, and the chlorine consumption and bacterial counts were determined. Of the many runs by this procedure two are presented: an organic chlorine compound being used in Table II, and an inorganic one in Table III.

While there is a marked difference in the consumption of chlorine in the soapy wash of the two experiments here presented, it is to be pointed out that this is no criterion as to regularity of chlorine consumption in the numerous experiments performed in this series. The tables are selected at random and merely to indicate the system of operation.

In the soapy wash solution the chlorine is consumed by the fatty acid

TABLE II

	Soapy Wash			Chlorine Solution	
Hours	Av. Cl.	Bact. per c.c.	Bact. per Spoon	Av. Cl.	Bact. per Spoon
1st	195	5	0	205	0
2nd	121	18	100	196	120
3rd	118	40	0	173	300
4th	63	13	400	152	0
5th	202	3	0	134	60
6th	188	8	60	119	700
7th	168	7	20	117	20
Cl. consumed	165	94	580	88	1,200

TABLE III

	Soapy Wash			Chlorine Solution	
Hours	Av. Cl.	Bact. per c.c.	Bact. per Spoon	Av. Cl.	Bact. per Spoon
1st	323	10	30	313	2
2nd	50	3	40	302	0
3rd	140	15	0	295	0
4th	14	250	400	182	0
5th	7	200	760	159	0
6th	205	500	860	145	0
7th	32	200	320	130	0
Cl. consumed	579	1,177	2,410	183	2

radicle of the soap and the organic food substances. We have found that there is a wide variation in the chlorine consumption not only by different soaps, but as well by the same soap under different conditions, and presumably different foods in large or small quantities consume variable amounts. Then too there is not only the consumption of chlorine but as well the pH of the solution as affected by the wide variation in the alkalinity of soaps, the pH in turn influencing the germicidal properties of the chlorine.

As shown in Tables II and III, the amount of organic chlorine preparation consumed was only about one-third that of the inorganic preparation, but as previously pointed out, the availability of germicidal chlorine in the field of action is important. This availability of germicidal chlorine has two extremes in the several chlorine preparations: in the organic least available, in the alkaline inorganic most available. The one is not readily consumable, the other easily broken down into its end product oxygen, and immediately available in abundance for quick action.

DISCUSSION

That there is need for a higher standard of eating utensil sanitation in public eating places is indicated by the recent finding that 33 per cent of the organisms remain on the utensils after they are washed (soiled 150,000 and washed 50,000 bacteria per spoon). This percentage represents a cross-section of 46 different restaurants including both the better and poorer types.

If by the soapy water washing method dishes are to be disinfected by either machine or hand washing, they must be subjected to a scalding rinse. At the better places where there is watchful supervision and also an adequacy of scalding water, the disinfection is fairly satisfactory. By the mechanical method at carelessly supervised places the water at the start may be scalding, but by repeated use the temperature drops below the disinfection point. The water then becomes highly contaminated and the dishes carry an increasing load of bacteria. In machines so operated we have found the wash water to carry 300,000 organisms per c.c. and spoons contaminated to the extent of 120,000 bacteria per spoon. This is not the fault of the machine, but it is the entrance into the equation of the personal element. In general, the operators of these machines are unskilled and come largely from a floating population.

In those eating places using mechanical washers where there is insufficient scalding water the disinfection results

would be greatly improved by the use of an inorganic chlorine preparation in the rinse water.

So far, the most satisfactory, but not altogether practical, method for the cleansing and disinfection of utensils by hand is first to rinse off the organic food particles in running hot water, second to wash in an alkali cleanser as tri-sodium phosphate-chlorine solution, and third to immerse in a suitable chlorine solution. When all the dishes of the first set have been placed in the third compartment containing chlorine solution, they should remain there until the second set have reached the second compartment. Thus there is the necessary time exposure in the two disinfecting solutions of 8 to 12 minutes. The water should be maintained at hot hand washing temperature which is about 120° F.

While it is recognized that a chlorine solution will destroy most infectious organisms of the saliva-borne group, the question is still open as to whether or not under practical working conditions it renders the tubercle bacillus non-infectious. This question is of great importance and requires special research.

CONCLUSIONS

1. There is presented a method for determining the efficiency of disinfection of eating utensils by the multiple spoon-bacteriological test.

2. There is pointed out the importance of maintaining a low bacterial count in the wash water, thus securing better disinfection and eliminating a hazard to both dish washer and to the public.

3. The second or rinse water compartment of the mechanical washer may carry a chlorine solution as an additional measure of disinfection.

4. The two compartment procedure for washing beverage glasses, with either soap or alkaline detergent and chlorine in the first, and organic chlorine solution in the second, is satisfactory if the time exposure is sufficient for disinfection purposes. It being understood that the available chlorine in the first be not less than 200 p.p.m. in solution after saturating the organic matter of the soap with chlorine, and a minimum, at no time less than 50 p.p.m.

5. There is presented a procedure for washing dishes by hand, using a sink of three compartments, two of which contain chlorine. It is believed this procedure will give satisfactory disinfection results under practical working conditions. An extended test in the field is, however, necessary to prove its practicability.

REFERENCES

1. Cumming, James G., and Spruit, Charles B. Transmission of the Pneumonia Producing Group of Organisms. *Mil. Surgeon*, Apr., 1920.

2. Lynch and Cumming. The Distribution of Influenza by Indirect Contact—Hands and Eating Utensils. *A.J.P.H.*, Jan., 1919.

3. Cumming. Saliva-borne Disease Transmission with Epidemiological and Bacteriological Research. *Mil. Surgeon*, Feb., 1920.

4. Lynch and Cumming. The Epidemiology of Influenza-Pneumonia. *J. Lab. & Clin. Med.*, Mar., 1920.

5. Cumming. Influenza-Pneumonia as Influenced by Dish Washing in Three Hundred and Seventy Institutions. *A.J.P.H.*, Nov., 1919, Concluded July, 1920.

6. Cumming, Spruit, Reuter. Saliva-borne Infections: Their Transmission through Eating Utensils. *Mod. Med.*, July, 1920.

7. Cumming and Spruit. The Transmission of the Pneumonia Producing Group of Organisms. *Mil. Surgeon*, Apr., 1920.

8. Cumming. Can the Tuberculosis Transmission Rate be Reduced *J.A.M.A.*, Apr. 17, 1920.

9. Cumming. Saliva-borne Disease Control: Eradication. *Mil. Surgeon.*, Oct., 1930.

Biology of the Oyster in Relation to Sanitation*

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OWING to several anatomical and physiological features of the oyster, the sanitary control of the oyster industry presents certain difficulties not encountered in the handling and marketing of other perishable sea foods. An understanding of the biology of this mollusk seems indispensable for an intelligent application of the principles of sanitation to this highly specialized branch of the fish industry. The fact that great quantities of oysters are consumed raw and that, excepting its shell, it is eaten in its entirety, makes the question of what constitutes the oyster's food and how it is taken in of great practical importance. Because the mode of feeding of the oyster consists in straining great volumes of water through the gills and ingesting the microscopical suspended material, the purity of the meat is correlated closely with the organism's activity and the character of the water surrounding it.

The feeding of the oyster is controlled by at least 3 sets of organs: gills, mantle, and adductor muscle. The gill may be regarded as the most conspicuous organ of the lamellibranch body which, besides its primary respiratory function, has become a principal organ of feeding, comparable to a very complex sieve capable of filtering a large quantity of water. The synchronous beating of the ciliae covering the surface of the gill, forces the water through the pores into the epibranchial chamber (spaces above the gill lamellae) and into the cloaca. The rate of feeding is therefore entirely dependent upon the efficiency of the ciliated mechanism of the gill. The latter, however, is affected by physical and chemical changes in the outside environment which exert upon it either a stimulating or depressing influence. The filtering capacity varies with size, shape and condition of the organism, but in all the oysters it is controlled by the temperature. At a temperature of about 25° C. an adult oyster may filter as much as 7 liters of water per hour, the rate decreasing with a drop in temperature and at 7° C. activity ceases.

It is obvious that inhibition of ciliary motion results in a deficiency or complete cessation of feeding. This conclusion, made from the results of experiments, was fully corroborated by the author's observations during 3 years (1932–1935) on oysters in Long Island Sound. Stomachs and intestines examined at bi-weekly intervals were completely devoid of food and even no trace of crystalline style was found in the samples taken during the cold season when the temperature of the water was less than 7° C.

* Read at a Joint Session of the Laboratory, Food and Nutrition, and Public Health Engineering Sections of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 8, 1935.

From the point of view of sanitation it is of interest to determine the efficiency of the oyster gills in removing bacteria from the water. Experiments (Galtsoff, 1928) carried out with oysters placed in water to which a known number of *B. coli* was added, show that only 30 per cent of bacteria are retained by the gills. Apparently these microörganisms are so small that they can pass easily between the cilia and escape back into the water.

The feeding of the oyster is also influenced by the length of time the shells remain open and by the position of the two mantles which, by coming together, may considerably reduce the amount of water sucked in by the gills. Hopkins (1931) has demonstrated in *Ostrea lurida* that it is not so much the existing temperature of the water which determines how long the shell remains open as it is the changes in temperature which control the behavior of the adductor muscle, and are therefore of far greater importance. Falling temperature causes the shells to close, while a rise in temperature is followed by opening. The length of time which oysters remain open depends upon several factors and varies in different localities. From the point of view of sanitary control it is of interest to mention that *Ostrea virginica* may slightly open its shell at 4–5° C. when no current is produced by the gills and consequently no food is found in the intestinal tract.

The oyster possesses a well developed chemical sense which permits the organism to react to changes in the water and detect the presence of small amounts of irritating substances. When a polluting substance is present the oyster protects itself by closing the valves and reducing the number of hours of feeding. Should these conditions prevail for a long time, growth is retarded, the flesh becomes emaciated, and increased mortality ensues. Investigations carried out on the effects of pulp mill pollution (Hopkins, Galtsoff, and McMillan, 1931) showed that death occurred more quickly among oysters which kept their valves open for a longer period of time, those surviving longer which considerably reduced the daily average number of hours during which their shells remained open.

The nutritive value of the oyster meat varies with the seasons and is influenced by the conditions under which it grows. From the nutritional point of view the quality of the oyster is determined by the per cent of solids, glycogen, mineral salts, and vitamin content of the meat. Only the first two factors have been subject to systematic investigation. Normally oyster meat contains about 80 per cent of water, being however, subject to wide fluctuations. Under certain conditions, it is rather difficult to establish a definite standard. Present regulations designed to prevent adulteration forbid putting oysters in water of lower salinity than that in which they were grown. Oysters are very tolerant of changes in salinity. They may thrive as well in water having about 10 parts of salts per 1,000 as in that with salinity ranging between 22 and 27. Moreover, the water content of the meat may vary independently of changes in salinity of the surrounding water. The author's observations show that the water content of oyster meats may increase from 80 to 88 per cent immediately following the shedding of eggs and sperm. As a rule oysters become watery after spawning although the salinity remains constant.

Early in the fall oysters begin to store glycogen, the content of which may reach as high as 12–14 per cent (fresh basis). This process is accompanied by an increase in solids and a corresponding decrease of water in the tissues. At this time oysters have

the highest nutritive value. With the onset of cold weather feeding ceases, though the glycogen content remains on a high level throughout the winter. This indicates that all the physiological activities are greatly reduced and that during the hibernating period the organism draws but little on the supplies stored in its tissues. It is remarkable that in spite of the complete cessation of feeding the growth of shell both in length and weight continues.

There is no information regarding the seasonal fluctuations in the contents of heavy metals and vitamins in oyster tissues, though there are sufficient data to show the existence of a definite correlation between the iron and copper content and their geographical distribution (Galtsoff, 1934). In general, oysters from the North Atlantic are poor in iron and rich in copper, while the reverse is true for the South Atlantic and Gulf States, the variation occurring gradually as we proceed along the coast from Rhode Island to Florida. This suggests that the observed changes are not incidental but may be due to differences in the chemical composition of water. Unfortunately our knowledge regarding the iron and copper metabolism in the oyster is too incomplete to justify further speculation regarding the significance of the observed facts.

An understanding of the salient biological features of the oyster may be useful to the public health officer in outlining and executing an efficient sanitary control of the oyster industry. One must bear in mind that the oyster is readily affected by changes in environment, and easily adapts itself to new conditions. In this respect it differs from other sea food and presents more difficulties from the point of view of sanitation.

REFERENCES

Galtsoff, P. S. Experimental Study of the Function of the Oyster Gills. *Bull. U. S. Bur. Fish.*, 44:1–39, 1928.

The Effect of Temperature on the Mechanical Activity of the Gills of the Oyster. *J. General Physiol.*, 11:415–431, 1928.

The Biochemistry of the Invertebrates of the Sea. *Ecological Monographs*, 4:481–490, 1934.

Galtsoff, P. S. and Whipple, D. V. Oxygen Consumption of Normal and Green Oysters. *Bull. U. S. Bur. Fish.*, 46:489–508, 1931.

Hopkins, A. E. Temperatures and the Shell Movements of Oysters. *Bull. U. S. Bur. Fish.*, 47:1–14, 1931.

Sensory Stimulation of the Oyster, Ostrea Virginica, by Chemicals. *Bull. U. S. Bur. Fish.*, 47:249–261, 1932.

Hopkins, A. E. and Galtsoff, P. S. and McMillan. Effects of Pulp Mill Pollution on Oysters. *Bull. U. S. Bur. Fish.*, 47:125–186, 1931.

The Lag in Education

EVEN the more magnificent scientific discoveries, especially those of recent years, have not penetrated into our general education, and are entirely disregarded in most discussions of social problems. And yet an imposing accumulation of critical information of wide bearing is at our disposal which might become an active factor in the readjustment of the troubled relations of man were it possible to overcome the obstacles to its general dissemination and acceptance.—James Harvey Robinson, *Humanizing of Knowledge*, 1924.

A Rapid Slide Test for the Serological Diagnosis of Typhoid and Paratyphoid Fevers*

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ONE of us with Stuart [1] has described a rapid slide test using concentrated antigens with undiluted sera for the diagnosis of typhoid and paratyphoid fevers. The method proposed follows in general the Huddleson technic [2] for the diagnosis of Brucella infection, the efficiency and accuracy of which have been demonstrated by Lienhardt and Kitselman,[3] Palmer and Baker,[4] and Welch and Mickle.[5] The slide test for the diagnosis of typhoid and paratyphoid fevers makes use of 4 antigens: an alcohol treated *Eberthella typhosa* 'O', *Eberthella typhosa* 'H', *Salmonella paratyphi*, and *Salmonella schottmuelleri*. The antigens are about the consistency of thin cream and are prepared by growing large quantities of organisms on agar in Blake bottles and washing the growth off with concentrated formolized salt solution. All antigens are standardized by titration against known positive and negative sera the titers of which have been previously determined by a standard tube test technic. The test takes approximately 4 minutes to complete. The rapidity and ease with which it may be carried out routinely seemed to us to be an important factor in public health laboratories where speed and accuracy in reporting results to physicians are necessary. In hospitals where an early exclusion of typhoid in certain undiagnosed cases is often important, the rapid slide test should be invaluable.

It has become increasingly evident that some type of 'O' antigen should be included in the routine Widal test to obtain the most accurate interpretation of the agglutinins that are found in cases of suspected enteric disease. In the New York State [6] and Michigan [7] Departments of Health the value of the use of the 'O' type of antigen as well as the 'H' has been definitely shown. The investigations of Gardner,[8] Smith,[9] Craigie,[10] Wyllie,[11] Bole,[12] and others demonstrate the relationship of the 'O' and 'H' agglutinins in sera to vaccination and infection and further emphasize the importance of the 'O' agglutinin in diagnosis.

The method of preparation of our alcohol treated antigen (*E. typhosa* 'O') has been simplified. The method reported was as follows [1]:

Eberthella Typhosa Somatic 'O'—The same strain used in preparation of the flagel-

* Read before the Laboratory Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 7, 1935.

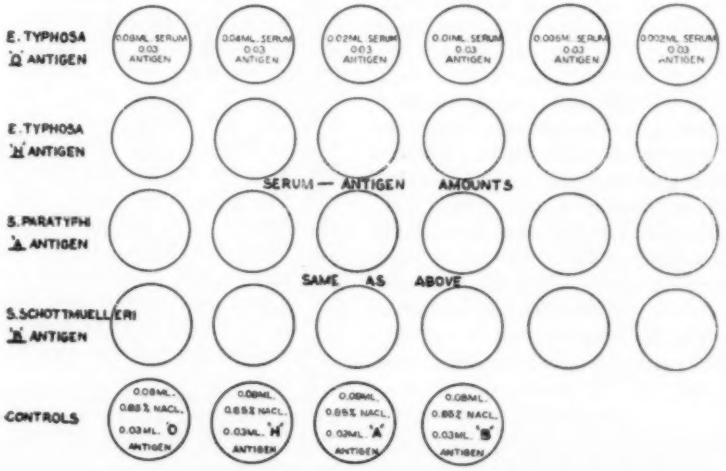
late (HO) antigen is used in making the 'O' antigen. The organisms are grown for 48 hours at 37° C. rather than for 24 hours and are washed from the surface of the agar with 12 per cent NaCl rather than with the formolized salt solution. After centrifugation the supernatant fluid is discarded and the packed bacterial cells are pooled using just sufficient 0.85 per cent salt solution for transfer purposes. This concentrated suspension is placed in a large flask and 15–20 volumes of 95 per cent alcohol is added, the flask shaken vigorously for 10 minutes and incubated at 37° C. for 24 hours. At the end of the incubation period the antigen appears as a flocculent white mass from which considerable of the alcohol may be siphoned and discarded. The remaining alcohol is removed by centrifugation. About 5–7 ml. of 12 per cent salt is added for each 1 ml. of packed bacterial cells and the concentrated suspension is ready for titration.

Instead of centrifugation to get rid of the supernatant fluid, after the organisms have been washed from the agar with 12 per cent formolized salt solution and pooled, 3 volumes of alcohol are added directly to the salt solution suspension of organisms. The flask is shaken vigorously for 10 minutes and incubated at 37° C. for 24 hours. From this point on the preparation of the 'O' antigen follows the original method. This modification saves 1 centrifugation without apparently affecting the efficiency of the final product.

Since our publication,[1] 1,100 sera have been studied with the rapid slide method, and the results compared with our standard tube test technic. The latter test makes use of live organisms as an antigen for the *Eberthella typhosa* 'H', *Salmonella paratyphi*, *Salmonella schottmuelleri* and an alcohol treated antigen for the *Eberthella typhosa* 'O'. All antigens are made to correspond to a turbidity of 6.9 on the Gates[13] apparatus. The serum is diluted 1:10 through 1:320 in a definite sequence and 0.5 ml. of antigen added to each dilution making the final dilutions 1:20 through 1:640. The tube tests are incubated at 52°–55° C. for 3 hours, followed by refrigeration over night. Final readings are made the following day.

FIGURE I

Showing Serum-Antigen Amounts Used in the Slide Test


E. TYPHOSA 'O' ANTIGEN
0.08ML. SERUM 0.03 ANTIGEN
0.04ML. SERUM 0.03 ANTIGEN
0.02ML SERUM 0.03 ANTIGEN
0.01ML. SERUM 0.03 ANTIGEN
0.005M. SERUM 0.03 ANTIGEN
0.002ML SERUM 0.03 ANTIGEN
E. TYPHOSA 'H' ANTIGEN
SERUM — ANTIGEN AMOUNTS
S. PARATYPHI 'A' ANTIGEN
SAME AS ABOVE
S. SCHOTTMUELLERI 'B' ANTIGEN
CONTROLS
0.08ML. 0.85% NACL. 0.03ML. 'O' ANTIGEN
0.08ML. 0.85% NACL. 0.03ML. 'H' ANTIGEN
0.08ML. 0.85% NACL. 0.02ML. 'A' ANTIGEN
0.08ML. 0.85% NACL. 0.03ML. 'B' ANTIGEN

METHOD

In the routine diagnostic slide test the patient's serum is pipetted onto a 5" x 7" glass slide in the following amounts: 0.08, 0.04, 0.02, 0.01, 0.005, and 0.002 ml. in the four rows of rings as shown in Figure I, using a Kahn pipette (0.2 ml. graduated in thousandths). In the fifth row (used only for the first test each day) 0.08 ml. of 0.85 per cent salt solution is added to each of the four rings for controls on each of the four antigens. A drop of 'O' antigen is added to each of the serum amounts in the first row and to the first ring in the fifth row. Similarly, a drop of 'H' antigen is added to each of the serum amounts in the second row and to the second ring in the fifth row. *S. paratyphi* is added to the third row and *S. schottmuelleri* to the fourth row, each with the appropriate controls in the third and fourth rings respectively in the fifth row. The above serum-antigen mixtures in each row correspond to dilutions of 1:20 through 1:640 in the tube test. All antigens are shaken gently but well before using. Each row of serum-antigen mixture is thoroughly mixed with a separate toothpick or applicator starting with the smallest amount (0.002 ml.) of serum and working from right to left. After mixing, the glass slide is gently rocked back and forth 15–20 times and the degree of clumping estimated. The type of agglutination obtained with the 'O' antigen does not correspond to the typical small flaking or granular agglutination obtained in the tube test, and hence 'O' and 'H' agglutination cannot be differentiated by appearance. This is no disadvantage since both types of antigens are used.

RESULTS

Of the 1,100 sera tested by both the slide and tube methods, 400 were sent to these laboratories for the Wassermann test, 200 of which were tested with the regular tube test technic and 200 by the New York State method. The results were compared with those obtained with the slide test on all 400 sera.* The results are given in Table I.

Since the Connecticut tube test technic did not make use of an 'O' antigen at the time this series of tests was begun, but used only a living, motile culture, the New York State 'O' antigen was used in testing all 400 sera listed in Table I. It will be noted that the percentage of reactions obtained with the first 200 sera (when using the New York State 'O' antigen with the Connecticut technic) were quite comparable with the percentage for the second 200 (where the New York State technic was followed), 12.6 per cent of the sera showing reactions in the first 200 sera and 15.5 per cent in the second 200. From an inspection of Table I it will be seen that in all instances with the exception of *S. paratyphi* 'A' antigen the slide tests showed a lower percentage of reactions than did the Connecticut tube test. This was particularly true in the case of the 'O' antigen. On the other hand, when compared with the New York State tube test a greater percentage of reactions was obtained with the slide 'H' antigen than with the New York State 'H'. However, the slide 'O' antigen again showed considerably fewer reactions when compared with the New York State tube test 'O'. It would appear that the slide test is slightly more specific than the Connecticut tube test method, and this would appear also to be true with the slide 'O' antigen when compared with the New York State tube test 'O', although the slide 'H' is definitely less specific when compared with the New York State tube test 'H' antigen. The degree of agglutination obtained with the New York State 'H' antigen was greater than the degree of agglutination obtained with the 'H' slide antigen in most instances.

Seven hundred * of the sera used to

* The New York 'H' and 'O' antigens used were kindly furnished by the New York State Laboratories at Albany, N. Y.

* The authors are indebted to Dr. M. H. McCrady, Montreal, Que., to Dr. J. G. McAlpine, Montgomery, Ala., and to Esther Brintzenhoff, Providence, R. I., who kindly furnished us with some of the sera used in these studies.

TABLE I

SLIDE TEST RESULTS ON 400 WASSERMANN SERA, 200 COMPARED WITH CONNECTICUT TUBE TEST AND 200 WITH THE NEW YORK STATE TUBE TEST

Number of Sera	*Method*	*Percentage Reactions With Antigens*			
		H	*O*	*A*	*B*
200	Conn. Tube	48.0	12.6[1]	9.5	61.0
	Slide Test	36.0	0.1	10.5	43.5
200	N.Y.S. Tube[2]	32.5*	15.5*	....	....
	Slide Test	42.5	8.5	....	....

* The New York antigens were kindly furnished by the Division of Laboratories and Research of the New York State Department of Health.

[1] Using New York State antigen with Connecticut technic.

[2] As nearly as possible the New York State method was followed throughout.

make comparisons between the tube and slide technics were sera sent for the routine Widal test. One hundred, or 14.4 per cent, were from known cases of typhoid or paratyphoid fevers demonstrated clinically or by isolation of the etiological agent. Fifty, or 7.1 per cent, were from individuals known to have had vaccine. Two hundred and sixty sera, or 37.1 per cent, showed partial reactions by one or both tests and 290, or 41.4 per cent, showed no reactions with either test.

In Table II are summarized the results obtained in a comparison of the tube and slide tests on sera from 100 cases, 73 of which were cases of typhoid fever and 27 cases of paratyphoid B. With the typhoid sera the slide test gave fewer negative results with both the 'O' and 'H' antigens than the tube test with these antigens. This greater degree of sensitivity of the slide test is reflected in the cross-reactions obtained with the 'A' and 'B' antigens since the slide test showed fewer completely negative results than did the tube test with these antigens. The cross-reactions obtained with the 'A' and 'B' antigens in the slide test were usually slight reactions in the first 2 dilutions. This is shown in the higher percentages of reactions obtained with the 'A' and 'B' antigens in the 1:20 and 1:40 dilutions. A higher percentage of reactions was obtained in the 1:320 dilution with the tube 'O' antigen (62.5 per cent) than with the slide 'O' antigen (47.9 per cent). On the other hand, the reverse of this is true with the 'H' antigens (tube test 42.5 per cent and slide test 66.6 per cent).

With the sera from 27 cases of paratyphoid B (Table II) both tests failed to show agglutination with the 'B' antigen in 11.1 per cent of the cases. A diagnosis of these cases was made by isolation of the organism. Cross-agglutinations with the 'O' antigen in the slide test were obtained in the same percentage (59.3 per cent) of cases as with the 'H'. Fewer cross-reactions with the 'O' and 'H' antigens were obtained in the tube test ('O' 23.8 per cent; 'H' 37.0 per cent). This was not true with 'A' antigens since the tube 'A' showed reactions in 44.5 per cent of the paratyphoid B cases, whereas the slide 'A' antigen showed cross-reactions in only 25.9 per cent. A higher percentage of reactions was obtained in the 1:320 dilution with the slide 'B' antigen than with the tube 'B' antigen in known paratyphoid B cases. In general, the results obtained on the sera from the paratyphoid cases are similar to those obtained on the sera from the typhoid cases (Table II).

In Table III are given the results obtained on 50 sera from known vac-

TABLE II

COMPARISON OF TUBE AND SLIDE TEST REACTIONS ON SERA FROM 100 CASES OF TYPHOID AND PARATYPHOID FEVERS

Positive Reactions by Dilutions on 73 Cases of Typhoid Fever

	Per Cent Negative	Per Cent Positive, by Dilutions				
		1:20	1:40	1:80	1:160	1:320
Tube O	14.5	2.0	6.2	12.5	2.0	62.5
Slide O	8.2	2.7	9.5	9.5	21.8	47.9
Tube H	4.1	1.3	6.9	39.8	5.4	42.5
Slide H	2.8	1.4	4.1	8.3	16.5	66.6
Tube A	67.6	5.0	7.5	7.5	5.0	7.5
Slide A	55.2	7.4	11.9	11.9	7.4	5.9
Tube B	41.8	4.4	13.4	11.9	19.4	8.9
Slide B	34.8	14.5	20.2	13.0	5.8	11.6

Positive Reactions by Dilutions on 27 Cases of Paratyphoid B

	Per Cent Negative	Per Cent Positive, by Dilutions				
		1:20	1:40	1:80	1:160	1:320
Tube O	76.2	0	9.5	0	14.3	0
Slide O	40.7	0	11.1	29.6	7.4	11.1
Tube H	63.0	7.4	7.4	11.1	7.4	3.7
Slide H	40.7	0	11.1	25.8	7.4	14.8
Tube A	55.5	22.2	11.1	11.1	0	0
Slide A	74.1	0	3.7	11.1	11.1	0
Tube B	11.1	0	7.4	7.4	29.6	44.4
Slide B	11.1	0	11.1	7.4	7.4	63.0

cinated individuals. The 'H', 'A', and 'B' agglutinins predominated in this vaccinated group although some reaction was obtained with the slide 'O' antigen in 40 per cent of these sera and with the tube 'O' antigen in 44.3 per cent. It will be noted in connection with this that 4 per cent (2 sera) showed a reaction in the 1:320 dilution in the 'O' antigen of the slide test. These sera were obtained from recently vaccinated individuals, which probably accounts for the high titered 'O' agglutination. In the older vaccinated individuals 'O' agglutinins rarely appeared and when present were found only in low dilutions. The percentage of reactions obtained with the 'O' antigen in the vaccinated group is slightly higher than that reported by

TABLE III

COMPARISON OF TUBE AND SLIDE TESTS ON SERA FROM 50 VACCINATED INDIVIDUALS

	Per Cent Negative	Percentage Reactions by Dilutions				
		1:20	1:40	1:80	1:160	1:320
Tube O	55.7	7.4	22.2	11.1	3.7	0
Slide O	60.0	10.0	16.0	4.0	6.0	4.0
Tube H	8.0	2.0	24.0	22.0	22.0	22.0
Slide H	6.0	0	12.0	18.0	18.0	46.0
Tube A	72.6	8.1	10.8	8.1	0	0
Slide A	40.0	4.0	18.0	26.0	10.0	2.0
Tube B	24.0	12.0	14.0	26.0	14.0	10.0
Slide B	18.0	0	22.0	12.0	34.0	12.0

Bole.[12] It would appear from the results obtained in the vaccinated group that the use of all 4 antigens (O, H, A, and B) in the Widal test is extremely helpful in separating the vaccinated individuals from those with known typhoid fever. In general, the results obtained with the tube test and slide tests in the vaccinated group are comparable, although, with the exception of the 'O' antigen, a greater degree of sensitivity was demonstrated with the slide test.

Partial reactions were obtained by one or both tests in 260, or 37.1 per cent of the 700 sera examined. These reactions were usually ++, +, or ± results in the 1:20, 1:40 or 1:80 dilutions although occasionally reactions were obtained in higher dilutions. Twenty-nine sera in this group showed slight reactions in the slide test with no reaction in the tube test, and 47 showed reactions in the tube test which were negative in the slide test. The remaining 184 sera in the questionable group gave partial reactions with one or more of the antigens in both tests. Since in none of the individuals, from which these 260 sera were obtained, was it possible to demonstrate typhoid or paratyphoid fever it would appear that the slide test was slightly more specific. From the results obtained by both tube and slide tests with these questionable sera it appeared that vaccine had been administered previously to some individuals although no definite history was obtained.

The remaining 290, or 41.4 per cent of the 700 sera, received for the Widal examination gave complete negative results with both tests.

DISCUSSION

The large amount of work that has been done in recent years on the standardization of the Widal test and the interpretation of results has made it evident that the use of an 'O' antigen as well as an 'H' is necessary for the serological analysis of a suspected serum. However, even though an 'O' antigen is used, the widespread inoculation with typhoid-paratyphoid vaccine as well as the number of cases of previous enteric infection, both of which stimulate the production of agglutinins for the typhoid-paratyphoid group of organisms, lowers the specificity of the Widal test regardless of the method. No Widal test is infallible and it is not likely that any will be developed that will lower the validity of the isolation of the etiological agent. Although in some cases of typhoid and paratyphoid fevers isolation of the causative organism is made several days before agglutinins are demonstrated in the serum of the patient, in a large number of cases it is not, and agglutination tests are necessary. The value of the Widal test is dependent upon the standardization and maintenance of antigens that will give consistent results.

In the development of the slide test considerable emphasis has been placed upon the preparation of antigens which will give consistent results over several months. The standard tube test, used in these laboratories for several years, although ordinarily giving consistent results, requires considerable work to maintain smooth cultures and antigens which will not vary in their reactions. It has been necessary in using this method to standardize antigens daily (living cultures) and to check organisms for smoothness every 3 weeks. This standard tube test method was shown to be the most efficient when compared with 5 others by Moore.[14] The slide test antigens were standardized as nearly as possible against the antigens used in our tube test.

In general, in the study of 1,100 sera, the results obtained with the slide test compared very favorably with the results obtained with the standard tube

test. The slight differences in the specificity and sensitivity do not appear to be significant. In known cases of typhoid fever the slide test showed fewer complete negative results with the 'O' and 'H' antigens while in the 23 cases of paratyphoid B reported both the slide and the tube test showed exactly the same percentage of negative results. In these cases of paratyphoid B the organism was isolated early in the course of the disease before agglutinins could be demonstrated.

In the investigation of the rapid slide test our main interest has been to develop a test which would give us as consistent results as our standard tube test. We feel that this result has been realized with the technic presented, and that a marked saving in time, glassware, and material has been obtained. The slide antigens give consistent results for at least 5 to 6 months, which is a distinct advantage over our tube test method which requires frequent time consuming standardization. The fact that the slide test results on a serum may be obtained within a few minutes after it is received in the laboratory is a distinct advantage over the tube test technic which usually requires 15–24 hours to complete. We have found also that it is possible to standardize the slide test antigens within reasonable limits to other tube test technics. This should be an advantage to laboratories that are completely satisfied with their tube test technic, but desire to obtain results on suspected sera in a shorter interval of time.

In a comparison of the New York State tube test technic with the slide test on 200 Wassermann sera excellent agreement was obtained in spite of the fact that the slide test antigens were not standardized against the New York State antigens. Similar results were obtained with the 80 sera kindly sent to us by Dr. McCrady who had used the Dreyer technic in the analysis of these. In this group of 80 sera only 3 showed disagreement in results, and in 2 of these 3 the results obtained were sufficiently clear-cut in both tests to establish a diagnosis.

It would appear to us that the slide test proposed should be an excellent one for routine diagnostic purposes in public health laboratories where speed and accuracy in reporting results to the physicians are necessary, as well as in hospital laboratories where exclusion of typhoid in certain undiagnosed fevers is often important.

SUMMARY

A rapid slide test for the diagnosis of typhoid and paratyphoid fevers is presented which requires approximately 4 minutes to complete. The results obtained in a study of 1,100 sera indicate that the slide test is at least as sensitive and specific as the tube tests with which it was compared. The stability of the antigens used, the speed and accuracy with which a serum may be analyzed by this method, and the consistency of the results obtained, indicate that the test should be an excellent one for use in public health laboratories and in hospitals where an early exclusion of typhoid fever in certain undiagnosed cases is often important.

REFERENCES

1. Welch, H., and Stuart, C. A. A Rapid Slide Test for the Serological Diagnosis of Typhoid and Paratyphoid Fevers. *J. Lab. & Clin. Med.* In press.

2. Huddleson, I. F., and Abell, E. Rapid Macroscopic Agglutination for the Serum Diagnosis of Bang's Abortion Disease. *J. Infect. Dis.*, 42:242, 1928.

3. Lienhardt, H. F., and Kitselman, C. H. Correlation of the Rapid and Long Agglutination Tests for Infectious Abortion of Cattle. *J. Am. Vet. Med. Assn.*, 73:328, 1928.

4. Palmer, C. C., and Baker, H. R. Correlation of the Rapid and Slow Agglutination Tests for Infectious Abortion of Cattle. *J. Am. Vet. Med. Assn.*, 75:86, 1929.

5. Welch, H., and Mickle, F. L. Comparison of the Huddleson Slide Test and the Macroscopic Tube Test in Undulant Fever. *J. Lab. & Clin. Med.*, 17:67, 1931.

6. Gilbert, R., and Coleman, M. R. Agglutination in the Diagnosis of Enteric Diseases. *A.J.P.H.*, 23:693 (July), 1933.
7. Eldering, G., and Larkum, N. W. Antigens in the Widal Test. *A.J.P.H.*, 21:1370 (Dec.), 1931.
8. Gardner, A. D. The Small Flaking or 'O' Agglutination of Permanent Standardized 'O' Suspensions of *B. typhosus* by the Serums of Normal, Inoculated and Infected Persons. *J. Hyg.*, 28:376, 1928.
9. Smith, T., and Reagh, A. L. The Non-Identity of Agglutinins Acting Upon the Flagella and Upon the Body of Bacteria. *J. Med. Res.*, 10:89, 1903–4.
10. Craigie, J. Studies on the Serological Relations of the Flagella of B. typhosus. *J. Immunol.*, 21:417, 1931.
11. Wyllie, J. Experiences with Small Flaking or Granular Agglutination in Normal Inoculated and Enteric Fever Cases. *J. Hyg.*, 32:1, 1932.
12. Bole, R. Value of the H and O Agglutination Technic in Routine Widal Examinations. *J. Lab. & Clin. Med.*, 20:638, 1935.
13. Gates, F. L. A Method of Standardizing Bacterial Suspensions. *J. Exper. Med.*, 31:105, 1920.
14. Moore, M. R. Various Bacillus Typhosus Antigens Used for the Macroscopic Widal. *A.J.P.H.*, 25:848 (July), 1935.

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Aluminum in Food

PROPAGANDA as to possible dangers resulting from the use of aluminum cooking vessels is so persistent that one suspects ulterior motives in its background. The problem has been investigated at various times, and in the presence of a renewed criticism of the widespread employment of aluminum vessels another recent study of the subject has appeared under the auspices of the British Ministry of Health. (Monier-Williams, G. W.—*Aluminum in Food*, Report 78 on Public Health and Medical Subjects, London, Ministry of Health, 1935.) The accurate determination of aluminum in food and biologic material, according to Monier-Williams, who wrote the report, is a difficult matter. The amount usually present is small and cannot easily be separated completely from iron and other metals. The method that has finally been adopted depends on the precipitation by 8-hydroxyquinoline and, although considerably longer than some of the colorimetric methods, has the advantages that it is applicable over a wide range of aluminum content and that the aluminum is obtained in a form in which it can be weighed or titrated. The figures for the amount of metal taken up by food from aluminum vessels vary considerably, owing to different conditions of experiment. Distilled water, whether hot or cold, has almost no action. Hard waters, however, corrode aluminum slightly and the same is true of organic acids. Aluminum is readily acted on by alkalis, and cooking utensils are therefore liable to be damaged if cleaned too often with soda. The problem of whether or not aluminum is injurious in moderate doses involves a number of different questions. It is probable that a considerable proportion taken into the stomach is soluble. Whether it can diffuse through the walls of the intestinal tract and get into the blood is a matter of further controversy, and at present judgment on this matter must be suspended. Aluminum salts in doses that are not unreasonably high have been shown to have some action on digestive processes.

There is no convincing evidence, however, that aluminum in the amounts in which it is likely to be consumed as a result of the use of aluminum utensils has a harmful effect on the ordinary consumer.—*J.A.M.A.*, Jan. 18, 1936, p. 218.

An Epidemic of Dengue*

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THERE has been some general information about the epidemiology of dengue for a considerable time, but it is only since the epoch making work of Siler, Hall, and Hitchens [1] that we have had exact information regarding the transmission of the disease. The first accurate descriptions of dengue were by Brylon of Java in 1779, and by Benjamin Rush of Philadelphia in 1780.[2] Reference to transmission by mosquitoes was made by Graham, of Beirut, Syria, in 1903.[3] For a long time it was thought that some such variety of culex as the *quinquefasciatus* or *C. fatigans* was the principal transmitter, a point which was not cleared up until the researches of Siler and his coworkers in the Philippines, and later confirmed by Simmons, St. John, and Reynolds.[4]

With the above facts established, the control of an epidemic is made possible through a systematic anti-larval campaign, *i.e.*, preventing the full development of mosquito larvae of the species which has been proved to be a carrier of the disease. Inasmuch as Siler's work definitely incriminated the *Aëdes aegypti* (formerly known as the *Stegomyia fasciata*), a mosquito which is in this country the only known carrier of yellow fever, the control will consist of the same procedure as employed in control and suppression of an outbreak of yellow fever.

There are some points wherein the two diseases differ: Mortality in dengue is very low, by some given as from 1 in 5,000 to 1 in 1,000, while in yellow fever 10 per cent has been regarded as a low death rate. Among my series of 478 cases on the coast of Peru on which history was available,[5] the mortality was 40 to 41 per cent. Among white Europeans in West Africa it seemed to run as high as 66 per cent. The second important point of difference lies in a lasting immunity following an attack of yellow fever, while in dengue there appears to be a short immunity, and not of uniform occurrence at that. Immunization by an attack becomes an important item in shaping a campaign for the control of an epidemic. It will make a considerable difference in the required critical index of mosquito production. In yellow fever the critical index may be said to be the percentage of mosquito production which permits the propagation of the disease. The index will vary according to the number of immunes in the population, *i.e.*, the infected mosquitoes may feed on immunes and die before taking another blood meal. The greater the number of immunes in a population, the easier it will be to stop the epidemic. Under such conditions the epidemic will cease while the mosquito incidence is still high. If there are few or practically no immunes, the mosquito production must be brought to a very low level. Owing to the low immunity production in dengue the mosquito incidence, *i.e.*, the production

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index, would have to be brought close to a relative zero.

An epidemic of dengue can best be discussed by referring to the sequence of events in a locality where such an epidemic has occurred. When we received word from Dr. George MacDonnell, Health Officer of Miami,[6] that he had found a number of cases of dengue, we at once thought of the possibility of its spreading to other points in the state, and eventually throughout the whole South.

It appears that epidemics of dengue occur periodically at intervals of from 8 to 10 or 12 years. This is rather interesting when one considers the evanescent nature of the immunity conferred. In the past there had never been a systematic anti-aegypti campaign for the control of dengue. Our effort in Florida in 1934, in so far as I know, was the first attempt to control and wipe out an epidemic of dengue by anti-larval methods. Dr. MacDonnell put on a force of 50 inspectors for the city of Miami, and also exercised some supervision of the suburban areas. The writer, with the assistance of Dr. T. H. D. Griffitts, of the U. S. Public Health Service, made a tour of the principal cities in the southern part of the state, urging the adoption of a clean-up campaign to stop the breeding of the *A. aegypti* as the surest safeguard against the appearance of dengue in the community. A town or city which does not have adult *aegypti* cannot have dengue. I was anxious to demonstrate that an epidemic of this nature could be confined to the state where it originated. To do so required prompt and energetic measures. One of the difficulties encountered was the lack of experienced personnel. One must learn the habits of the mosquito before effective inspection can be made. In many places relief labor was relied upon, as in Tampa, where in spite of several weeks of inspection many new cases of dengue were reported. On checking the areas which had been reported free of *aegypti* by the relief workers, we found the breeding profuse, and many adult mosquitoes on the wing. It became necessary to send in several trained inspectors to supervise the work and to train personnel, in order to insure a prompt reduction in *aegypti* production.

I wish again to call attention to the need for a low index of breeding or production of *aegypti* before one can hope to control an epidemic of dengue. Our work in Florida last year served as a demonstration of what must be done to control an epidemic of a disease which is propagated by container-born mosquitoes. The *aegypti* is a species which in nature breeds only in artificial containers, and then preferably near or within human habitation.

The appearance of dengue also served to awaken the people to a realization of the universal distribution of the vector of both dengue and yellow fever. The belief had been general that there were not enough *aegypti* on the wing to make possible the spread of an epidemic of yellow fever, and that should some cases appear we would be able to stop the epidemic promptly. Dengue control was further complicated by the irregularity with which inspection personnel could be obtained. The majority of communities used relief labor for this purpose, and the almost daily shifting of personnel resulted in a surplus of untrained as well as uninterested labor. The results of such inexpert inspection were often *nil*, or worse, in that the authorities then had a false sense of security. Checking the breeding in reportedly inspected areas, we found larvae and pupae galore.

It was difficult to determine the extent of the epidemic. We did not have a sufficient number of trained physicians to visit all the reported cases. Most of the mild cases were never seen by a physician; hence the ratio of cases to

the actual number reported was thought to be about 10 to 1. On the other hand, the fact that dengue had been proved to exist caused many questionable cases to be reported as dengue which otherwise would have been reported as something else. It is also true that the announcement of an unusual disease will sometimes result in enough reported cases to simulate an epidemic, if there is not an adequate medical force to investigate and correct the reports. Griffitts [7] shows a distribution of the towns reporting dengue. Many of these reported only 1 case, and the probability is that in some instances there was no dengue, while in others there may have been the estimated 10 cases for each 1 reported. In Griffitts's analysis of the ages of the sick it was found that all age periods from 1 year up to 70 were represented. This is as it should be in a disease which does not confer a lasting immunity. In contrast I can cite the incidence of yellow fever in the Peruvian epidemics of 1918 to 1921,[5] in which most of the cases occurred in individuals under 30 years of age, among those who were native to the territory affected. It was found that those older, who contracted yellow fever, had come into the area after the last epidemic, which occurred from about 1895 to 1897.

In a study of immunity in dengue by Sharp and Hollar [8] the conclusions point to a transitory immunity, and to the fact that it does not regularly follow an attack. Suggestions are also to the effect that there may be a strain specificity. The duration of immunity is thought to vary from 1 to 4 years.

In Greece the mortality was reported to be high, but a close analysis indicated that it occurred among elderly people and those with chronic disease. In such instances it is a question whether the mortality should be charged to dengue other than as a contributory factor.

CONCLUSION

The recent epidemic in Florida is thought to be the first in which a serious attempt was made to control dengue through anti-larval methods. If no effort had been made it is believed that there would have been a general epidemic over the entire South like that of 1922.

In controlling dengue by anti-larval work it will require a lower index of breeding than it does to control an epidemic of yellow fever.

Immunity in dengue is irregular while in yellow fever it appears to be universal and permanent. Herein lies an important factor in the mosquito control of the two diseases.

Trained personnel with a knowledge of the habits of mosquitoes is necessary for the control of any mosquito-borne disease, and especially for the control of dengue.

While it is the same mosquito which carries both yellow fever and dengue, it requires a more intensified destruction of breeding places to control and wipe out an epidemic of dengue than it does to wipe out an epidemic of yellow fever.

REFERENCES

1. Siler, J. F., Hall, M. W., and Hitchens, A. P. *Dengue: Its History, Epidemiology, Mechanism of Transmission, Etiology, Clinical Manifestations, Immunity and Prevention.* Manila, Bur. of Print., 1926.

2. Coleman, T. D. Dengue. *Nelson's Loose-Leaf Living Medicine,* Vol. 2, Ch. 34, p. 106.

3. Graham, H. The Dengue. A Study of Its Pathology and Mode of Propagation. *J. Trop. Med.,* 6:209–214, 1903.

4. Simmons, J. S., St. John, J. H. and Reynolds, H. K. *Experimental Studies of Dengue.* Manila, Bur. of Print., 1931.

5. Hanson, H. Observations on the Age and Sex Incidence of Deaths and Recoveries in the Yellow Fever Epidemic in the Department of Lambayeque, Peru, in 1921. *Am. J. Trop. Med.,* 9:233–239, 1929.

6. MacDonnell, G. N. The Dengue Epidemic in Miami. *J. Florida Med. Assn.,* 21:392–395, 1935.

7. Griffitts, T. H. D. Dengue in Florida, 1934, and Its Significance. *J. Florida Med. Assn.,* 21:395–397, 1935.

8. Sharp, W. B. and Hollar, E. Immunity in Dengue Fever. *Am. J. Trop. Med.,* 21:247–263, 1935.

Detection and Significance of Escherichia coli in Commercial Fish and Fillets*

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THE use of marine fish as food has increased tremendously in recent years. Better distribution facilities, increased advertising, and the general recognition that fish is a nutritious food and an important source of essential minerals, have all contributed toward popularizing fishery products as a regular part of the diet.

Changes in the methods of handling and marketing certain marine fish have occurred coincidently with their increased use. Formerly very little fresh fish was sold except "in the round," *i.e.*, as caught, or else eviscerated. A large proportion of the catch of cod, haddock, and hake was eviscerated, split, salted, dried, and sold as dried salt fish or "fish flakes."

Today a large proportion of the fresh or frozen fish is "packaged," that is, it is sold prepared either as fillets or in other ready-to-use form. According to the statistics of the U. S. Bureau of Fisheries,[1] 49,000,000 lb. of fish, chiefly haddock, valued at about $5,500,000, were sold as fresh or frozen fillets in 1933. The fish are usually caught by otter trawls, hand lines, or purse seines, and are eviscerated on the vessel, packed in ice in bins or cribs, and brought to port. After being sold to commercial dealers the fish are washed, scaled, and filleted. The fillets are washed, usually in a salt brine, wrapped in parchment, and those sold fresh are packed in 10 and 25 lb. quantities in tin boxes, which in turn are packed in ice for retail shipment.

So much handling, between catching and purchase by the consumer, naturally increases the chances of contamination and the rapidity of subsequent spoilage, particularly in fillet form.

Laboratory tests for the sanitary quality of various food products have come into wide use. However, the bacteriological examination of marine fish has not become common and there are no standard methods for such examination.

There are two possible standards on which the quality of market fish might be based; one the total bacterial count on the fish flesh, and the other the detection of some specific type of bacteria, such as *Escherichia coli*, sanitary significance of which could be interpreted.

REVIEW OF LITERATURE

The majority of investigators agree that the flesh of live fish and of freshly

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caught fish is sterile. Hunter [2] and Fellers [3] found that the digestive tract and flesh of migrating salmon was usually sterile. Proctor and Nickerson,[4] in examining the flesh of 96 fish, frozen with dry ice immediately upon being caught, and examined upon reaching the laboratory, reported all except one sample to be sterile.

The slime of fish is not sterile and, after the death of the fish, serves as an excellent medium for the rapid multiplication of bacteria. Gee [5] made isolations from slime of live haddock and found numerous organisms. Stewart [6] examined the slime content of 22 haddock. Of the 247 cultures isolated, 140 corresponded in general characteristics with the genus Achromobacter. Organisms of the mammalian intestinal type were not found, and only 4 cultures belonging to the genus Aerobacter were isolated.

All investigators agree that bacterial invasion of the flesh occurs soon after the death of the fish. The number of organisms present and the rate of spoilage depend on several factors, temperature of storage and carefulness of handling probably being most important. Griffiths and Stansby [7] in studying the correlation between chemical and bacterial tests for freshness of fish flesh found that with market haddock, caught from 4 to 10 days, the bacterial count was between 10,000 and 100,000 per gm., while counts of 500,000 to 1,000,000 were typical of very stale and unmarketable fish. The maximum period during which haddock stored in ice could be kept in an edible condition was between 16 and 21 days. Fillets, because of their greater initial contamination, spoil more rapidly.

Because of the public health significance of *Escherichia coli* in water and foods as an indication of potentially dangerous contamination, the possibility of its occurrence in the intestinal tract of lower animals and of fish has been investigated. Gibbons [8] in a review of literature and as the result of his own investigations concluded:

> *E. coli, E. communior* and *A. aerogenes* are not normal inhabitants of the intestinal tract of marine fishes. Representatives of the genera Escherichia and Aerobacter may be found in marine fishes, but they seldom occur in fish taken some distance off-shore. The fecal forms are particularly rare, except in fish taken near shore or in contaminated waters.

Griffiths [9] did not find fecal *Escherichia coli* in the slime or flesh of fresh haddock, but found typical fecal *E. coli* on 5 commercial fillets examined. Hunter [10] considered the presence of *E. coli* in cooked crab meat an indication of contamination due to faulty handling.

PURPOSE OF THE PRESENT INVESTIGATION

It was the purpose of the present study to investigate the occurrence of bacteria of the coli-aerogenes group on market fillets and whole fish, and to determine the proportion of these organisms which could be identified as fecal (mammalian) *Escherichia coli*.

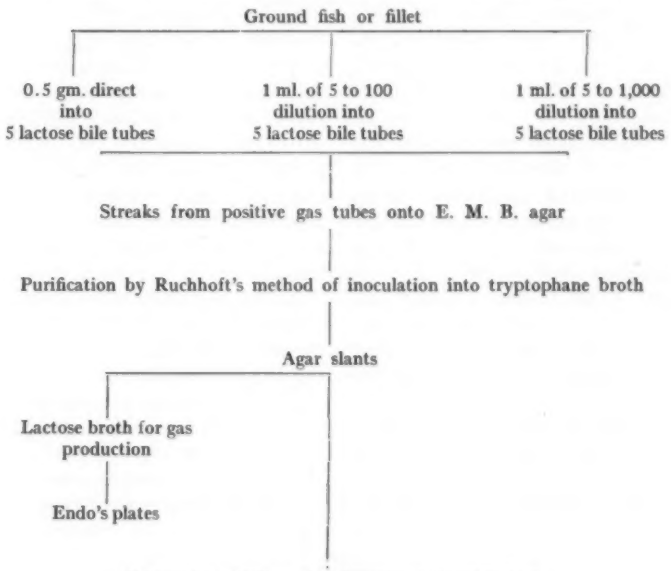
METHOD OF INVESTIGATION

Fish and fillets were purchased from retail stores. The fish were carefully filleted in the laboratory and both the laboratory and the store fillets were skinned. The flesh was then ground twice through sterile meat grinders into sterile pans, and 5 gm. portions were weighed into dilution bottles containing 99 ml. of sterile water for a 5 to 100 dilution. After being in a mechanical shaker for 10 minutes, 10 ml. were added to 90 ml. of sterile water to make a 5 to 1,000 dilution. Five tubes of lactose peptone brilliant green bile broth were inoculated with 0.5 gm. portions of the ground fish, 5 tubes with 1 ml. of the 5 to 100 dilution, and 5 tubes with 1 ml. of the

5 to 1,000 dilution. After incubation at 37° C. for 48 hours, the number of gas-positive fermentations was noted and streaks from these tubes were made on eosin-methylene-blue agar plates. E.M.B. agar plates were used because they are believed to be slightly more selective than Endo's agar. After 24 hours, incubation colonies most resembling *E. coli* were picked and inoculated into lactose broth fermentation tubes. Those which failed to referment were classified as false presumptives, and discarded. From the positive tubes streaks were made upon Endo's medium to determine colony characteristics and insure the purity of the culture. Agar slants were made and saline suspensions from these used to inoculate tryptophane broth, Clark and Lubs medium, sodium citrate, and uric acid tubes. Readings were made

FIGURE 1

DIAGRAM OF PROCEDURE AND CLASSIFICATION OF ORGANISMS


Ground fish or fillet
0.5 gm. direct into 5 lactose bile tubes
1 ml. of 5 to 100 dilution into 5 lactose bile tubes
1 ml. of 5 to 1,000 dilution into 5 lactose bile tubes
Streaks from positive gas tubes onto E. M. B. agar
Purification by Ruchhoft's method of inoculation into tryptophane broth
Agar slants
Lactose broth for gas production
Endo's plates
Differential Media and Microscopic Examination

Classification

	Endo's	*V.P.*	*M.R.*	*Na. citrate*	*Uric Acid*	*Indol*
Escherichia coli	T	—	+	—	—	+
Intermediates						
a. coli-like	At	—	+	—	—	±
" "	T	—	+	+	—	±
b. indeterminate	?	?	?	?	?	?
c. aerogenes-like	T	+	+	+	+	+
Aerobacter aerogenes	T	+	—	+	+	—

At—not typical for *E. coli*

Indeterminates—various combinations of reactions not included elsewhere in the chart.

at 24 hours for indol production, and at 48 hours for the other tests except the methyl red reaction, which was determined after 96 hours' incubation. An organism was considered to be of fecal type if it was a Gram-negative rod producing typical *E. coli* colonies on Endo's medium, producing indol, and was methyl red positive, Voges-Proskauer, sodium citrate, and uric acid negative.

Twenty fillets purchased at intervals from May to August yielded 203 cultures producing gas in brilliant green lactose peptone bile broth in the primary inoculations. After repurification 181 of these refermented lactose, and of this number 60 were typical, according to the previous definition, of fecal *Escherichia coli*. Four of the 20 fillets did not show evidence of any typical fecal *Escherichia coli*. Five eviscerated haddock purchased during the same period yielded 44 gas positive tubes; 40 refermented lactose, and 4 were typical of fecal *E. coli*.

Brilliant green lactose peptone bile broth was used instead of the usual lactose broth because it was believed that this medium was more selective for organisms of the Gram-negative, lactose-fermenting type. From 6 fillets, where duplicate tubes were set up, lactose broth yielded 46 gas positives from which 10 typical *E. coli* were isolated, and brilliant green lactose peptone bile broth gave 54 positive gas tubes from which 17 typical *E. coli* were isolated.

False presumptive tests from the two sets of broths were about equal in frequency of occurrence. These apparent false presumptives may have been due to either the loss of the gas-producing organism on transfer, or to a non-colon type of symbiosis in the original direct inoculation.

Brilliant green lactose peptone bile broth alone was used for the remainder of the fillets. Table I shows the distribution of positive gas tubes from the dilutions of the fillet and fish.

The majority of isolations and the fewest false presumptive tests were obtained from the primary inoculation of 0.5 gm. flesh. The number of samples run is not large enough to consider this difference conclusive. Positive 5 to 1,000 tubes were obtained from 11 of 17 fillets and from only 2 fish.

Table II shows the distribution according to the 6 criteria mentioned of all the Gram-negative lactose-fermenting organisms isolated.

Of the cultures isolated from fillets, 60, or 30 per cent, were typical of fecal *E. coli*. From whole fish only 4 typical *E. coli* were isolated and the proportion of intermediates was higher. Gas pro-

TABLE I

DISTRIBUTION OF POSITIVE GAS TUBES AND ESCHERICHIA COLI FROM FISH AND FILLETS

	Fillet Sample No.																				*Fish Sample No.*				
Dilution	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5
Flesh, 0.5 gm.																									
Tubes positive	5	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Confirmed	5	5	4	5	5	2	5	4	5	4	4	2	5	5	5	5	5	4	4	5	5	5	3	5	5
E. coli found	4	5	1	0	1	0	2	2	4	2	1	1	2	3	0	0	3	2	1	1	0	1	0	3	0
5 to 100 dilution																									
Tubes positive	5	5	5	2	5	1	1	5	5	5	5	5	5	3	5	5	3	1	4	3	3	3	0	4	5
Confirmed	5	5	1	2	5	1	0	5	5	5	4	1	5	2	4	5	2	1	3	3	3	3	0	4	5
E. coli found	0	2	1	0	1	0	0	4	3	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0
5 to 1,000 dilution																									
Tubes positive	2	..	..	1	4	..	0	1	4	4	3	5	4	0	0	3	1	0	0	0	0	0	0	0	4
Confirmed	1	..	..	1	4	..	0	1	4	4	2	5	4	0	0	3	1	0	0	0	0	0	0	0	2
E. coli found	0	..	..	0	0	..	0	1	4	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0

TABLE II

CLASSIFICATION OF GRAM-NEGATIVE, LACTOSE-FERMENTING ORGANISMS ISOLATED FROM COMMERCIAL FILLETS AND FISH

	Flesh	*5 to 100 Dilution*	*5 to 1,000 Dilution*
Haddock Fillets			
Typical fecal *E. coli*	35	15	10
Intermediates—Coli-like	20	18	9
Indeterminate	26	23	8
Aerogenes-like	1	2	1
Typical *Aero. aerogenes*	4	7	2
False presumptives	9	12	1
Total number of cultures	95	77	31
Eviscerated Whole Haddock			
Typical fecal *E. coli*	4	0	0
Intermediates—Coli-like	4	3	0
Indeterminate	11	11	2
Aerogenes-like	2	1	0
Typical *Aero. aerogenes*	2	0	0
False presumptives	2	0	2
Total number of cultures	25	15	4

duction was seldom observed in dilutions of 5 to 1,000 of whole fish flesh. This would indicate that if treatment and handling were in any way related to the number of positive gas tubes, and to the type of organisms found, then the whole fish were considerably better in sanitary quality than were the fillets.

DISCUSSION

These experiments have demonstrated the presence of bacteria of the coli-aerogenes group on the flesh of commercial fillets and whole fish; and *E. coli* characteristic of mammalian feces was present on many of the samples examined, particularly on the fillets. Since the work of Gibbons, Fellers, and others has shown that *E. coli* is not usually found in, or on, marine fish from deep water, it follows that the fish and fillets most likely become contaminated with these organisms during handling. The process of making fillets involves the more extensive handling and consequently results in greater possibility of contamination; this is shown by the greater abundance of *E. coli* found on fillets than on whole fish.

The presence of *E. coli* in oysters and clams is used as an evidence of pollution, and if such pollution is sufficiently serious the products are condemned. The data presented indicate that many fillets, and some whole fish, purchased at random from public markets are contaminated, but a different use should probably be made of the information. The fact that fish are well cooked before they are eaten minimizes, and in most cases removes, any danger of illness resulting from this type of contamination.

A test for *E. coli* is probably better qualitative evidence of careless handling than a total bacterial count, and a test for this, and perhaps related organisms, might be used for educational purposes, among those engaged in bringing fish to the consumer, in the effort to improve the methods of handling and marketing.

The significance of members, other than *E. coli*, of the coli-aerogenes group, is a controversial subject. The *Standard Methods of Water Analysis* of the American Public Health Association considers the presence of members of the group to be sufficient evidence of pollution to justify condemning water. However, prominent investigators, particularly Levine,[11] Tonney-Noble,[12] and Koser,[13] insist that only *E. coli* are from feces and that other members of the group are of little, or no, sanitary significance. The authors of this paper are inclined to accept the latter view.

The investigation here reported does not represent a sufficient number of samples to make the results conclusive. It is the intent, rather, to offer this preliminary study as a suggestion to laboratories concerned with the studies of fishery products that the occurrence of *E. coli* on fish and fillets is worthy of wider study. It is hoped that methods may be devised for evaluating the sanitary quality of these fishery products.

SUMMARY

1. Twenty commercial haddock fillets and 5 eviscerated haddock were purchased from local retail markets and examined for the presence of members of the coli-aerogenes group of bacteria.

2. Typical *Escherichia coli* were found on 16 of the fillets, and on 2 of the eviscerated fish.

3. Lactose-fermenting organisms other than *Escherichia coli* were commonly encountered on both fillets and eviscerated fish. Because of this fact, gas production from lactose broth tubes taken alone is not sufficient evidence of contamination. Differential tests should be made to determine whether or not the responsible organism is *Escherichia coli*.

4. Further investigation is recommended to study the possibility of using the occurrence of *Escherichia coli* as an index of the sanitary quality of marine fish and fillets.

REFERENCES

1. Fiedler, R. H., Manning, J. R., and Johnson, F. F. Fishery Industries of the U. S., 1933. *Bureau of Fisheries Pub.*, Washington, D. C.

2. Hunter, A. C. Bacterial Decomposition of Salmon. *J. Bact.*, 5:353–361, 1920.

3. Fellers, C. R. Bacteriological Investigations on Raw Salmon Spoilage. Univ. of Washington *Pub. in Fisheries*, 1:157–188, 1926.

4. Proctor, B. E., and Nickerson, J. T. R. An Investigation of the Sterility of Fish Tissues. *J. Bact.*, 29:71, 1935.

5. Gee, A. H. Bacteria Concerned in the Spoilage of Haddock. *Cont. Canad. Biol.*, N.S., 3:349–363, 1927.

6. Stewart, M. M. The Bacterial Flora of the Slime and Intestinal Content of the Haddock. *J. Marine Biol. Assoc. United Kingdom*, 18:35–51, 1932.

7. Griffiths, F. P., and Stansby, M. E. Significance of the Bacterial Count and Chemical Tests in Determining the Relative Freshness of Haddock. *Trans. Am. Fisheries Soc.*, 64:401–407, 1934.

8. Gibbons, N. E. Lactose Fermenting Bacteria from the Intestinal Contents of Marine Fish. *Cont. Canad. Biol.*, N.S., 8:291–300, 1934.

9. Griffiths, F. P. *Studies on the Bacterial Content and Methods of Preventing Spoilage of Commercial Fish.* Doctors' Thesis. Mass. State College Library, 1935.

10. Hunter, A. C. Need for Methods for the Bacteriological Examination of Crustacea. *A.J.P.H.*, 24:199–202, 1934.

11. Levine, Max. Presumptive Tests for *B. coli*. *J. Am. Water Works Assoc.*, 5:168–171, 1918.

12. Tonney, F. O., and Noble, R. E. The Relation of Direct Bacterium coli and Bacterium aerogenes Counts to Sources of Pollution. *J. Am. Water Works Assoc.*, 22:488–501, 1930.

13. Koser, S. A., and Rettger, L. F. The Utilization of Nitrogenous Compounds of Definite Chemical Composition. *J. Infect. Dis.*, 24:301–321, 1919.

Can the Health Officer Safely Utilize Prophylactic Immunization as the Sole Means to Control Canine Rabies?*

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THE answer to the question "Can the health officer safely utilize prophylactic immunization as the sole means to control canine rabies?" is definitely in the negative.

In controlling outbreaks of rabies it is essential that the cycle by which the disease is propagated from one susceptible animal to another be broken, so that the disease ceases when the last infected animal succumbs.

The successful use of a prophylactic vaccine as a sole means of controlling rabies would be predicated upon the assumption (1) that the vaccine is 100 per cent effective, and (2) that every dog is treated with such a vaccine.

So far as I am aware no biological product has yet been developed that is 100 per cent effective, rabies vaccines being no exception, and the ever-present stray dog precludes the possibility of treating the entire dog population.

Since it is apparent that the use of vaccines alone cannot be depended upon to control the disease, it seems desirable to discuss the part that vaccination may play in the control of outbreaks of rabies.

Such methods as licensing dogs in general, quarantine measures, and the impounding and disposal of stray dogs, have been used for years, and the success of these measures has been proportional to the vigor with which they have been prosecuted. In some countries, notably England, these methods have resulted in complete eradication of the disease.

Following the work of the Japanese investigators, Umeno and Doi,[1] the prophylactic, single injection method of vaccination of dogs was introduced into the United States as an added weapon in the control of rabies. That it has had extensive use is indicated by the records of the Division of Virus-Serum Control, of the U. S. Bureau of Animal Industry, which has jurisdiction over biological houses operating under federal veterinary license. From January, 1923, to January, 1934, approximately 3,700,000 doses of this type of vaccine were prepared by such commercial houses.

The use of prophylactic vaccination in conjunction with other measures in controlling rabies is predicated on the reduction of the susceptibility of dogs in that area to the disease, and the extent to which vaccination will be an aid depends on the efficacy of the vaccines and their proper administration. Since the proper administration of the vaccine is a technical procedure, this should be

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left in the hands of the veterinarian. To be of value, vaccination need not be 100 per cent, but it should be reasonably effective; it should be a safe procedure; and, lastly, the limitations of the method should be recognized.

The U. S. Bureau of Animal Industry has made experimental investigations of the efficacy of the prophylactic single injection canine rabies vaccines and at various times has published the results. In the first publication [2] 5 separate experiments were made, in some of which the results were favorable, and in others unfavorable. Those familiar with animal experimental work, particularly with rabies, are cognizant of the difficulties of this type of experimentation and of the varied results that may occur. In rabies work, the type of material used to expose animals, the method used, and variations in individual animals are factors which have a bearing on the results and at times are difficult to control.

It was found that while the fixed virus entering into the vaccine was attenuated, it was capable, under certain circumstances, of inducing the fixed virus disease, a feature quite objectionable in a prophylactic vaccine. Biological houses were required to change their methods of production so that the virus entering into the vaccine was killed. This is the type of vaccine that is now, and for some years has been, in use commercially in this country. The bureau's experimental work on this type of vaccine was reported in later papers.[3, 4] These experiments, while limited, indicated that resistance to rabies could be increased in many dogs by a single injection of vaccine. However, this resistance is only relative—in some animals it may be strong, in others weak, or lacking, so that some may be able to withstand actual exposure to the disease whereas others may not. The duration of immunity also probably varies. Experimental information indicates that appreciable immunity in some dogs may persist for at least a year. Immunity should not be expected to last longer.

Observations from the field use of the vaccine indicate that vaccination has been of value in the hands of many veterinarians. However, failures of the vaccines to protect have also been reported. These observations are in accord with our experimental work. The amount of exposure that an animal receives and the individual variations are no doubt factors that have a bearing on the effectiveness of vaccination.

It is important, therefore, to recognize that while the resistance to rabies of many vaccinated dogs may be raised, failures to protect can and do occur, and no false sense of security should prevail because of such vaccination.

Reports from the field indicate that many thousands of dogs have been vaccinated with no untoward effect from the vaccine itself. Occasional reports indicate that unfavorable reactions occur from the injection. These have been indicated by paralysis, for the most part transitory, although a few cases have had a fatal termination. No generally satisfactory explanation as to the cause of these adverse reactions has been advanced. The commercial vaccines in use in this country are killed by phenol or chloroform. Federal regulations require that the vaccines be injected subdurally into rabbits (the most rigid test available) as a test for viability of the virus before these are marketed. If the vaccines are properly prepared, they should contain no viable virus capable of producing the disease. When unfavorable reactions occur in dogs, it appears that these occur with certain lots of vaccine, and while we have examined such lots of vaccine, we have been unable to demonstrate the presence of living virus as a responsible factor. The idea has been put forth, however, that in some part of certain vaccines, viable virus may be present in larger portions

of brain tissue which may have escaped the action of the killing agent, and when injected into a particularly susceptible dog may result in a fixed virus infection. Other explanations have been suggested, viz., a rabies toxin, toxic material contained in the brain tissue entering into the vaccine, etc.

While field evidence on the use of vaccine indicates that untoward reactions occur infrequently, the fact that they can and do occur should be recognized. Much of the opposition by dog owners to vaccination is based on fear of these reactions. Dog owners are entitled to a frank appraisal of the vaccines. There is no doubt that vaccination has been unjustly accused of causing trouble in many cases in which it was in no way responsible.

Since vaccination may be a possible hazard to the dog, even though this may be quite remote, it would appear that the general use of vaccine should be restricted to actual or potential outbreaks of the disease.

Since there is a possibility of a negative phase following vaccination, it seems desirable to confine treated dogs for 2 to 3 weeks following vaccination.

It is desired to emphasize again that vaccination, no matter how effective, cannot in itself control rabies. The vigor with which such other control measures as licensing and quarantine, and the impounding and disposal of stray dogs are carried out will determine to a large extent the duration of outbreaks in communities.

REFERENCES

1. Umeno, [illegible], and Doi, Y. A Study of the Anti-Rabic Inoculation of Dogs and the Results of Its Practical Application. *Kitasato Arch. Exper. Med.*, IV:89, 1921.

2. Schoening, Harry W. Studies on the Single-Injection Method of Vaccination as a Prophylactic Against Rabies in Dogs. *J. Agri. Res.*, XXX:431, 1925.

3. Schoening, Harry W. Experimental and Field Results of the Single-Injection Canine Rabies Vaccine. *Cornell Vet.*, XVIII, 2:105–115, 1928.

4. Schoening, Harry W. Experimental Studies with Killed Canine Rabies Vaccines. *J. Am. Vet. Med. Assn.*, LXXVI:25–33, N. S. 29 (1).

Tuberculosis in Dairy Cattle

THE U. S. Department of Agriculture has reported an outbreak of tuberculosis in a herd of dairy cattle located at the Federal Experiment Station at Beltsville, Md. This herd which is used for experimental purposes has been accredited for tuberculosis freedom for 18 years and has been maintained almost entirely by replacements raised on the farm. In the last previous test in October, one reactor to tuberculin appeared. On January 16, 82 reactors and 11 suspect reactors were revealed.

In accordance with the policy of the Department of Agriculture, these affected animals are being slaughtered and subjected to post-mortem examinations. The sudden appearance of the disease and the rapid spread were very unusual and no explanation could be found for the extensive outbreak. A study is being made to determine whether a virulent strain of the bovine organism gained access to the herd or whether, possibly, sabotage was responsible.

The situation illustrates a condition which may face health departments which have depended upon examinations for freedom from tuberculosis in dairy herds carried out at intervals much longer than those indicated in this outbreak.

Encephalitis of the St. Louis Type in Illinois *

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THE occurrence of an outbreak of 1,097 cases of encephalitis in St. Louis during the summer and autumn of 1933 came as a surprise to the medical profession and public health officials in this country. A complete record of the St. Louis outbreak has been published by the U. S. Public Health Service.[1] The general apprehension felt at that time was particularly acute in Illinois because of the close proximity of the outbreak. Accordingly, the attention of the Illinois Department of Public Health became focused upon the St. Louis area for the purpose of controlling the possible spread of the disease in this state.

The character of the St. Louis outbreak reminded Illinois public health officials of a similar one in Paris, Edgar County, Ill., in August, 1932. At that time there were 38 cases which were diagnosed as epidemic encephalitis by the attending physicians and representatives of the Illinois Department of Public Health. An epidemiological report was published by Houston [2] in December, 1932. The source of the illness could not be determined. Food and water supplies appeared to have no relation to the outbreak. None of the patients had been away from home, and no deviation from routine living habits of these persons had taken place. In 2 instances, relatives who had nursed patients became ill with encephalitis 15 and 6 days respectively after exposure. As 14 of the 38 patients died, there was a fatality rate of 37 per cent. No bacteriological or pathological studies were conducted. A survey of the recovered patients in May, 1935, revealed no sequelae attributable to their illness in 1932.

In the studies of the St. Louis outbreak of 1933, several strains of filtrable virus were isolated from brains of fatal cases by Muckenfuss, Armstrong, and McCordock,[3] and by Webster and Fite [4] by intracerebral inoculation of laboratory animals. This virus will be referred to as the St. Louis virus. Webster and Fite [4] found that blood from several of the recovered St. Louis patients contained specific protective properties against this virus when injected into mice. Shortly after, Webster and Fite [5] reported that 5 specimens of blood from persons who recovered from encephalitis in Paris, Ill., in 1932, also contained specific protective properties against the St. Louis virus.

Wooley and Armstrong [6] reported that blood specimens from 10 of 12 persons who recovered from this disease in Paris in 1932 contained specific protective properties against the St. Louis virus. These studies proved that the outbreak at Paris was caused by the same infecting agent as that at St. Louis. Blood collected by the writer in February, 1935, from 10 of the recovered patients in the 1932

* Read before the Epidemiology Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 7, 1935.

TABLE I

ENCEPHALITIS OF THE ST. LOUIS TYPE IN EDGAR COUNTY DURING THE SUMMER AND AUTUMN OF 1932

Age Groups	Cases	Deaths	Morbidity Rate (per 100,000)*	Mortality Rate (per 100,000)*	Case Fatality Per Cent
0–14	0	0	0	0	0
15–24	2	0	48	0	0
25–34	5	0	60	0	0
35–44	0	0	0	0	0
45–54	6	1	203	34	17
55–64	9	4	390	174	44
65–74	9	5	589	327	56
75 and Over	7	4	1,113	636	57
All Ages	38	14	152	56	37

* Calculated on population as of the fifteenth census of the United States: 1930.

TABLE II

ENCEPHALITIS OF THE ST. LOUIS TYPE IN ILLINOIS DURING THE SUMMER AND AUTUMN OF 1933

County	Cases	Deaths	Morbidity Rate (per 100,000)*	Mortality Rate (per 100,000)*	Case Fatality Per Cent
La Salle	7	3	7	3	43
Macon	7	2	9	3	29
Macoupin	10	4	21	8	40
Madison	24	7	17	5	29
Morgan	16	7	47	20	43
St. Clair	18	5	12	3	28
Entire State	177	62	2.3	0.81	35

* Calculated on population as of the fifteenth census of the United States: 1930.

outbreak in Paris, were submitted to the National Institute of Health* and the Rockefeller Institute for Medical Research* for conducting additional protection tests. It was found that blood from 7 of the 10 still contained protective properties against the St. Louis virus 30 months after the epidemic. As a result of all protection tests on blood specimens from the Paris outbreak of 1932, it was found that 13 of the 21 recovered patients had developed specific protective porperties against the St. Louis virus.

More cases of encephalitis occurred in Edgar County in 1932 than in any other county in the state (Table I). This small community had a morbidity rate of 152 per 100,000 population as compared to 100 in the outbreak in St. Louis in 1933. As in St. Louis, the largest number of fatalities occurred in persons in the upper age groups.

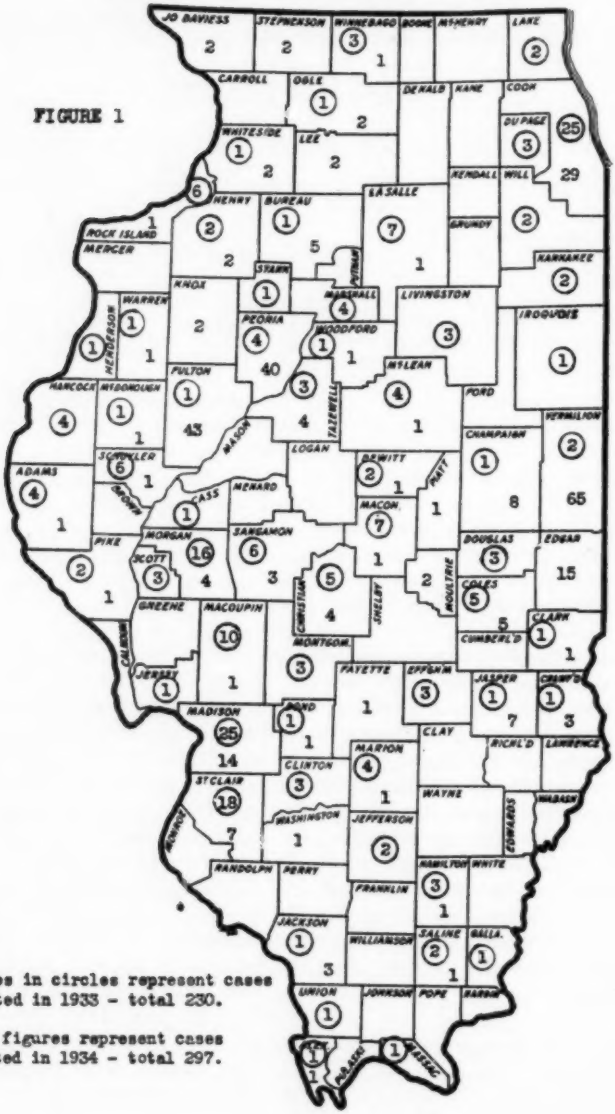
During the outbreak in St. Louis in 1933, 177 cases of the disease were recognized in Illinois, most of which occurred in Madison and St. Clair Counties, which are nearest St. Louis (Figure I).† No cases of this type of encephalitis occurred in Edgar County during 1933. The fatality rate, 35 per cent (Table II), was almost twice that of St. Louis,

* Results of the studies on blood specimens from Illinois were reported in personal communications to Dr. Frank J. Jirka, Director of the Illinois Department of Public Health. We wish to express the appreciation of the Illinois Department of Public Health to Drs. G. W. McCoy, J. P. Leake, and Charles Armstrong, of the National Institute of Health, and to Dr. Leslie T. Webster of the Rockefeller Institute for Medical Research for their coöperation in these studies.

† An analysis of the symptoms and physical findings in the outbreaks of 1933 and 1934 in Illinois has already been published.[7]

CASES OF ENCEPHALITIS (ALL TYPES) IN ILLINOIS REPORTED BY COUNTIES 1933 AND 1934

FIGURE 1



Figures in circles represent cases reported in 1933 - total 230.

Plain figures represent cases reported in 1934 - total 297.

20 per cent, during the corresponding period. The writer collected no specimens for the detection of protective properties in the blood of patients who recovered from encephalitis in Illinois during 1933.

As in the summer of 1933, there was a severe drought in Illinois in the summer of 1934. Early in August, the number of cases of encephalitis increased very rapidly, the peak being reached on September 1, following which there was a gradual decline during September and October. In contrast to 1933, when most of the cases of encephalitis occurred in counties near St. Louis, the largest numbers of cases in 1934 (Figure I) occurred in counties remote from the St. Louis area. During August, September, and October, 1934 (Table III), 234 cases of encephalitis occurred throughout the state with a fatality rate of 22 per cent, about the same as that in the St. Louis outbreak during 1933. It is of interest to note that Chicago escaped this type of encephalitis during the past 3 years, when it was prevalent in other sections of the state.

Edgar County was one of those reporting a large number of cases during 1934. The illness was not confined to persons in the upper age groups as in 1932 (Table IV). Most of the patients were residents of Paris. Of the blood specimens taken in February, 1935, from 9 of the 13 recovered patients, 5 were shown to contain protective prop-

TABLE III

ENCEPHALITIS OF THE ST. LOUIS TYPE IN ILLINOIS DURING THE SUMMER AND AUTUMN OF 1934

County	*Cases*	*Deaths*	*Morbidity Rate (per 100,000)**	*Mortality Rate (per 100,000)**	*Case Fatality Per Cent*
Champaign	8	1	12	2	13
Edgar	16	3	64	12	19
Fulton	43	14	98	32	33
Jasper	7	0	55	0	0
Madison	14	6	10	4	43
Peoria	40	6	28	4	15
St. Clair	7	3	4	1	29
Vermilion	65	9	73	11	14
Entire State	234	51	3	0.66	22

* Calculated on population as of the fifteenth census of the United States: 1930.

TABLE IV

ENCEPHALITIS OF THE ST. LOUIS TYPE IN EDGAR COUNTY DURING THE SUMMER AND AUTUMN OF 1934

Age Groups	*Cases*	*Deaths*	*Morbidity Rate (per 100,000)**	*Mortality Rate (per 100,000)**	*Case Fatality Per Cent*
0–14	2	0	29	0	0
15–24	2	0	48	0	0
25–34	1	0	30	0	0
35–44	2	0	64	0	0
45–54	1	1	34	34	100
55–64	3	0	130	0	0
65–74	2	1	131	65	50
75 and Over	3	1	477	159	33
All Ages	16	3	64	12	19

* Calculated on population as of the fifteenth census of the United States: 1930.

TABLE V

CASES OF ENCEPHALITIS (ALL TYPES) IN ILLINOIS
REPORTED BY MONTHS 1925–1935

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1925	15	13	12	10	5	6	7	8	10	5	6	15	112
1926	8	8	5	9	8	11	7	10	17	12	6	8	109
1927	9	11	8	16	14	7	9	9	7	3	9	10	112
1928	3	6	11	7	9	11	11	3	8	4	7	11	91
1929	8	7	14	6	15	1	5	12	3	2	5	2	80
1930	6	7	6	13	6	5	5	2	4	15	2	6	77
1931	4	6	5	5	5	5	7	0	13	5	1	7	63
1932	1	11	10	6	4	7	3	28	16	6	8	11	111
1933	6	2	5	8	2	5	4	24	95	58	12	9	230
1934	7	5	6	3	3	5	7	89	112	33	13	14	297
1935 *	18	6	10	18	11	8	7	10	13	11	8	3	123

* Complete figures for 1935 are included for purposes of comparison.

erties. Of particular interest is the fact that 1 of these persons was the 15 year old son of one of the recovered patients from the 1932 outbreak. Blood from both father and son contained protective properties. Thus, it was found that blood from 18 of 26 recovered patients from the 1932 and 1934 outbreaks in Paris showed specific protective properties against the St. Louis virus.

Of specimens of blood taken in October, 1934, from 21 of the recovered patients in Vermilion County who had had encephalitis during the preceding 2 months, 13 were found to contain protective properties against the 1933 St. Louis virus. Similarly, of blood specimens from 6 patients in Fulton County, 3 were found to contain protective properties. However, specimens of blood from 19 recovered patients in Peoria County failed to show protective properties against the St. Louis virus. These findings are interesting, in view of the fact that the disease in Peoria County was the same clinically as in other sections of the state. One is led to speculate upon the possibility of an unrelated virus which causes a similar disease, particularly in view of the studies of Armstrong and Wooley [8] on a second virus isolated from the brain of a patient who died in St. Louis in 1933, which caused lymphocytic choriomeningitis in mice. These investigators [8] found that the blood of a patient in Vermilion County who recovered from encephalitis in 1934, showed strong protective properties against the virus of choriomeningitis, in addition to protective properties against the St. Louis virus (Freeman strain).

Table V shows the number of cases of encephalitis of all types* reported to the Illinois Department of Public Health during the past 11 years. The increase in the number of cases during August, September, and October during 1932, 1933, and 1934 is worthy of note. The increase during the early months of 1935 is due to cases of post-infectious encephalitis following chicken pox, measles, and mumps, and not to primary encephalitis. With the appearance of mild weather in June, post-infectious encephalitis decreased. During the

* In *Monograph Number 214*, the U. S. Public Health Service classifies encephalitis as follows:

1. Infectious encephalitis:
   1. Type A, or Economo or lethargic type, chiefly sporadic
   2. Type B, chiefly epidemic
      (a) Japanese form
      (b) St. Louis form
   3. Other types, possibly the Australian
2. Post or para-infectious encephalitis, chiefly seen following measles, smallpox, vaccinia, or chicken pox

summer and autumn months of 1935 there was no increase in Type B encephalitis comparable to that of the preceding 3 years. Most of the reported cases during the summer of 1935 were Type A, or the Economo type.

SUMMARY

1. Outbreaks of encephalitis of the St. Louis type occurred in Paris, Edgar County, Ill., during 1932 and 1934 with a fatality rate of 31 per cent. Of 26 blood specimens from recovered patients, 18, or 70 per cent, were found by investigators in the National Institute of Health and the Rockefeller Institute for Medical Research to contain protective properties against the St. Louis virus.

2. During the course of the outbreak of encephalitis in St. Louis in 1933, 177 cases were reported in Illinois, with a fatality rate of 35 per cent.

3. During the summer and autumn of 1934, 234 cases of primary encephalitis were reported in Illinois, with a fatality rate of 22 per cent. Vermilion, Fulton, and Peoria Counties reported the largest numbers of cases.

4. Of 21 blood specimens from recovered patients in Vermilion County in 1934, 13, or 64 per cent, contained protective properties against the St. Louis virus.

5. Of 6 blood specimens from recovered patients in Fulton County in 1934, 3, or 50 per cent, contained protective properties against the St. Louis virus.

6. Blood specimens taken from 19 recovered patients in Peoria County in 1934 failed to show protective properties against the St. Louis virus. In view of the similarity of the clinical symptoms of these persons with those suffering from primary encephalitis in other sections of the state, the possibility that the illness was caused by an entirely unrelated virus should be considered.

REFERENCES

1. Report of the St. Louis Outbreak of Encephalitis. *Pub. Health Bull.*, 214, 1935.
2. Houston, H. S. Report of Epidemic of Encephalitis. *Illinois Health Quart.*, 4:174–175, 1932.
3. Muckenfuss, R. S., Armstrong, Charles, and McCordock, H. A., Encephalitis: Studies on Experimental Transmission. *Pub. Health Rep.*, 48:1341–1343, 1933.
4. Webster, L. T., and Fite, G. L. A Virus Encountered in the Study of Material from Cases of Encephalitis in the St. Louis and Kansas City Epidemics of 1933. *Science*, 78:463–475, 1933.
5. Webster, L. T., and Fite, G. L. Contribution to the Etiology of Encephalitis. Differentiation of Encephalitis by Protection Tests. *Proc. Soc. Exper. Biol. & Med.*, 31:344–346, 1933.
6. Wooley, J. G., and Armstrong, Charles. The Distribution of Immunity Against Encephalitis Virus of the St. Louis Type in the United States as Determined by the Serum-Protection Test in White Mice. *Pub. Health Rep.*, 49:1495–1505, 1934.
7. Tucker, Winston H. Distribution of Encephalitis (St. Louis Type) in Illinois During 1932, 1933, and 1934. *Illinois M. J.*, 68:61–66, 1935.
8. Armstrong, Charles, and Wooley, J. G. Studies on the Origin of a Newly Discovered Virus Which Causes Lymphocytic Choriomeningitis in Experimental Animals. *Pub. Health Rep.*, 50:537–541, 1935.

Too Many Claims Spoil the Medicine Man's Game

ALTHOUGH not nearly so common as they used to be, there are still occasional quack medicine vendors who stick to the old and illegal labels that claim for their nostrums curative powers over at least a good part of the ills and ailments that affect mankind.

Recently, for example, drug inspectors picked up samples of what were labeled "Devonshire's Earth Salts," marketed by F. S. Powers & Co., Crystal Lake, Ill. These were offered as a treatment for the following assortment of diseases and conditions: Pneumonia, cancer, diphtheria, typhoid fever, kidney and bowel trouble, appendicitis, intestinal worms and tape worms, locomotor ataxia, nervous disease, rheumatism, stomach trouble, skin diseases, malaria, high blood pressure, boils, abscesses, goiter, tumors, stomach ulcers, chills, colds, bronchitis, snake bites, delirium tremens, diabetes, venereal diseases, heart trouble, sterility in men and women, and also for "other disease conditions."

The nostrum got into interstate commerce and that brought it under the Federal Food and Drugs Act which penalizes sweeping claims not founded on fact and contrary to medical experience. A Federal court fined the seller.—U. S. Dept. of Agriculture *Release*, Feb. 16, 1936.

Dust Determinations*

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RESEARCH and experience have shown that concentration, composition, and particle size distribution are the main factors to be considered in determining if any particular dust will cause pneumoconiosis. The length of exposure to a harmful dust is a very important factor in actually producing the pneumoconiosis.

CONCENTRATION

In the United States the standard method of determining the concentration of a dust for industrial hygiene work is by use of the Greenburg-Smith impinger sampling instrument and the standard microscopic technic as described by U. S. Public Health Service.[1]

Many variations of this standard technic, such as using higher magnification for counting, darkfield illumination,[2] different sampling liquids, etc., have been employed in making dust counts—all with the purpose of obtaining a more accurate measure of the dust concentration to explain the harmfulness or non-harmfulness of certain dusty conditions.

After making several studies of dust conditions in industrial plants, it was believed that there should be a much simpler, faster, and more accurate method of determining the number concentration of dusts; a method which would eliminate many of the undesirable features of impinger determinations. Some of the objections which have been brought against the impinger method are:

1. The time required for obtaining results is long.
2. The dust is entrained in a liquid medium, where some particles may be soluble, and particles may coagulate or stick to the container.
3. Particles less than 0.7 to 0.8 microns are not counted.
4. Particle size determinations are not readily obtainable.
5. All aggregates of particles which may exist in the air are broken up.
6. Solid particles are sometimes fractured when they strike the impinger plate.
7. The efficiency, although high, is not 100 per cent and apparently decreases with particle size.

A consideration of other methods of sampling and counting showed that they all had many disadvantages and limitations. Probably any method which can be devised will have at least some of these objectionable features.

The thermal precipitator as developed by Professor Whytlaw-Gray and Dr. Lomax, and further improved and described by Green and Watson,[3] appears to have overcome many disadvantages of other methods. In this sampler the dusty air is drawn through a narrow rectangular channel 0.051 x 1.0 cm. at 6.5 c.c. per minute. The dust is deposited thermally, from a hot wire across the center of this channel to two cover slips which are held along the sides of the channel. The dust is

* Read before the Industrial Hygiene Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 8, 1935.

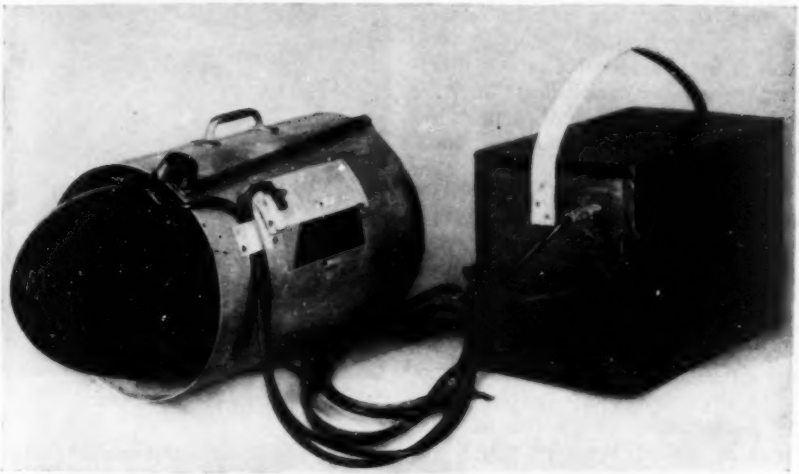

FIGURE I—Sampling Instrument and Power Supply

thus deposited in a narrow strip across two cover slips, giving a record similar to that of the Owens Jet Dust Counter. Its efficiency is claimed to be practically 100 per cent and the sample is obtained in a desirable condition.

Working in conjunction with Mr. Penney of our Research Department we have developed an Electrostatic Dust Count Sampler which I feel gives a desirable type of sample, the efficiency of the sampler being practically 100 per cent. A detailed description of this sampler will be given in the *Journal of Industrial Hygiene*, and only a brief description of it is given here.

A sample of the dusty air is trapped in a cylinder and deposited electrostatically over its inside surface. A microscope slide placed in one side of the cylinder receives its proportionate share of the total dust, the dust particles being, in general, uniformly distributed over the slide. This slide can then be removed, covered with a rectangular cover slip and examined microscopically.

The sampling instrument and its power supply are shown in Figure I. The sampling chamber consists of an aluminum cylinder 9″ in diameter and 12″ long, the ends of which are covered by disks of micarta. These ends, which support a fine ionizing wire axially through the center of the cylinder, can be opened and closed by the knob near the top of the cylinder. The slide holder as shown in Figure II holds a 25 x 75 mm. microscope slide under the two screws, the upper half being hinged to cover the slide. This holder fits into the opening in the side of the sampling chamber with the slide facing inward.

The sample is trapped by opening the ends, moving the cylinder to the exact sampling location, and closing the ends. Then the slide holder is opened and the dust deposited, this requiring about 15 seconds. A special microscope slide is used, as it must have a conducting surface over it to prevent distortion of the electrostatic field in the cylinder. These slides are prepared by a glass laboratory and are transparent and conducting, and the glaze is permanent. They cannot be used for darkfield illumination as obtained at present due to sub-microscopic particles in this

coating but they are entirely satisfactory for any lightfield determinations. This is not considered a serious disadvantage as many data indicate there are only a small percentage of particles less than 0.2 microns in industrial dusts. It is hoped that the slides can soon be obtained with a satisfactory surface for darkfield illumination so that the necessary research work on the finer particles can be carried out. Some research being carried on at present indicates that it may be possible to construct a sampler of this type which will use a regular microscope slide.

An advantage of this sampler is that an instantaneous sample can be taken when so desired. However, this is also a disadvantage since it cannot take a continuous sample. This objection is partially overcome since it takes a sample of about ½ cu. ft. at a time, and several samples can be taken on the same slide at intervals of about 15 seconds for short time variations; or several minutes for longer time variations.

These two samplers, the thermal and electrostatic, offer many advantages for sampling industrial dusts. It is sincerely hoped that after some experimental work one or the other can be adopted for general dust counting work.

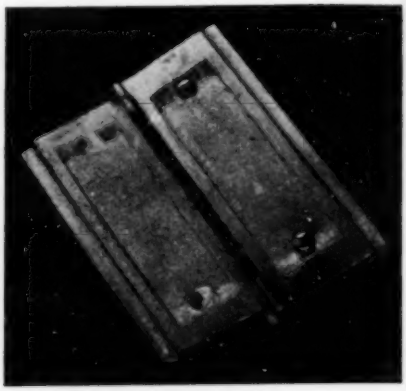

FIGURE II—Slide Holder

COMPOSITION

The determination of the composition of a dust is of utmost importance since it has been shown that only certain dusts produce pathological changes in the lung tissues. Apparently the mineralogical composition of many dusts is the factor of most importance.

The mineralogical composition of the larger dust particles or of pieces of the original mineral can in general be made with the petrographic microscope, but for most dusts the greater percentage of the particles is below this limit and cannot be determined in this way. There are a very few minerals which can be identified in the smaller particle sizes by a consideration of shape and certain optical properties.

The chemical composition of the dust can be accurately determined, and often a close approximation to the percentage of mineral constituents can be estimated from a complete chemical analysis of the sample and consideration of the chemical composition of the original materials.

For chemical analysis, the actual air-borne dust should be used, but it has been difficult to obtain a sample sufficient in quantity, but recent research has made it possible to build a small electrostatic air cleaner which can be used for this purpose. This will remove practically all of the dust from air which is drawn through by a small fan at the rate of 125 cu. ft. per minute. Its efficiency against fine particle smokes is 99.5 per cent by weight.

The cleaner consists of an ionizing chamber at the top and a group of parallel plates where the dust is deposited. The dust can then be brushed from the plates and used for chemical or other analyses. I will not give a theoretical discussion of the operation of this cleaner as it has not yet been published by our Research Department.

The complete sampler is shown in Figure III. It is 26″ high and 10″ x 16″ at the base, its weight about 50 lb. The air is drawn in at the top and downward through the sampling chamber by a small fan at the bottom of the cabinet. The ozone generated by the sampler is less than 1 part in 10 million. The power supply, which is located in the compartment at the rear, consists of a transformer, 2 rectifier tubes, and a condenser. It supplies 12,000 volt DC to the ionizing chamber and 4,500 volt to the plate assembly. The entire sampler is operated from any 110 volt, 60 cycle supply.

With this sampler it is possible to obtain a gram or more of dust in several hours in most dusty places. This sample can be used for accurate chemical analysis and for many other desirable determinations.

PARTICLE SIZE

Due to the research work of Gardner and associates [4] of Saranac Lake, it has been shown that in general the smaller sized particles are more active in producing fibrotic changes in the tissues where the dust lodges. This indicates that a very fine dust would be more harmful than a similar dust of large particle size.

Independent investigators have found that the particle size distribution of most industrially generated dusts is approximately the same. However, different investigators give widely different values for this. In general, this average particle size is from 0.6 to 1.5 microns.[3, 5, 6, 7]

No doubt some of these differences are due to different sampling methods and different microscopic technic; however, the microscopic magnification has been similar in most cases, and the minimum visible particle sizes should be similar.

The Owens Jet Dust Counter was used as the sampling instrument in most cases, and although its efficiency is questionable, the results should be comparable.

These indicate that the average particle size of different industrial dusts is quite different, and further show that a standardization on the best method would increase the value of the results many times.

The measurement of particle size by use of the filar micrometer is tedious and difficult for the smaller particles. The method of using a comparator graticule [6] in the eyepiece of the microscope is much easier. However, a method of micro-projection has been developed by Brown and Yant at the Bureau of Mines and is described in detail by them.[8] This is apparently the simplest, quickest, and most accurate of the various methods.

FIGURE III—The Complete Sampler

SUMMARY

A brief discussion of the standard dust counting method is given and several of the disadvantages enumerated. A consideration of the thermal precipitator and an electrostatic dust count sampler shows that at least some of the disadvantages have been overcome in these samplers, and this suggests that they are probably more desirable methods for dust counting. In determining the composition of an airborne dust it has been difficult to obtain a sample sufficient in quantity for chemical analysis, but a sampler has been developed for this purpose and it is described.

Particle size distribution of a dust is important, and data are given to show that the particle size distribution of dusts as determined by different investigators show marked variations. The best method of sampling and determination should be adopted as a standard. The method of microprojection seems to be the simplest, quickest, and most accurate.

REFERENCES

1. Greenburg, L. and Bloomfield, J. J. The Impinger Dust Sampling Apparatus. *Pub. Health Rep.*, 47, 12:654–675, 1932.
2. Hatch, T. and Pool, C. L. Quantitation of Impinger Dust Samples by Dark Field Microscopy. *J. Indust. Hyg.*, 16:177, 1934.
3. Green, H. L. and Watson, H. H. Physical Methods for the Estimation of the Dust Hazard in Industry. Medical Research Council, H. M. Stationery Office—*Code No. 45*:5–99, 1935.
4. Gardner, L. U. and Cummings, D. E. The Reaction to Fine and Medium-Sized Quartz and Aluminum Oxide Particles. *Am. J. Path.*, 9 (Suppl.): 751–63, 1933.
5. Bloomfield, J. J. Size Frequence of Industrial Dusts. *Pub. Health*, 48:961–968, 1933.
6. Green, H. L. Some Accurate Methods of Determining the Number and Size Frequency of Particles in Dusts. *J. Indust. Hyg.*, 16:29, 1934.
7. Batham, C., Rayner, H. E. G., Broose, H. D. Australian Dust Sampling in Sydney Sandstone Industry Studies in Idustrial Hygiene No. 12. *Report of Director General of Public Health, New South Wales, 1927.* Sect. 1-E *Industrial Hygiene*, Sydney, 1929, pp. 74–101.
8. Brown, C. E. and Yant, W. P. Micro-Projector for Determining Particle Size Distribution and Number Concentration of Atmospheric Dust. U. S. Bureau of Mines, *Report of Investigations No. 3289*, July, 1935.

DISCUSSION

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IN presenting his electrostatic dust sampling instrument and recommending its use, Mr. Barnes has premised its advantages on presumed faults of the impinger apparatus. The criteria which should be used in the selection of a dust sampling instrument for industrial hygiene studies are the collecting efficiency of the device, its ability to obtain large samples in a relatively brief period of time, its portability, its small errors in analysis, and, finally, the ease with which a sample once obtained may be analyzed. Mr. Barnes has listed 7 objections which have been brought against the impinger apparatus and the present method of analysis of impinger samples as conducted by the Public Health Service. Let us examine these objections in the light of the above criteria, and apply these same criteria to the instrument and method of analysis developed by Mr. Barnes, and described by him in the present paper.

The instrument described by Mr. Barnes is capable of taking an instantaneous sample of ½ cu. ft. volume. Mr. Barnes realizes the disadvantages of not being able to collect a continuous sample, and states that this objection is partially overcome by taking several samples on the same slide. Such a practice is apt to lead to erroneous results, due to the fact that the subsequent dust particles may be

deposited on those already collected on the slide, thereby yielding lower results. Such has been the experience with certain types of impingement devices in which the dust is deposited on a glass slide. If several slides are used, then the method becomes complicated.

Mr. Barnes's second objection is that the dust is entrained in a liquid medium where some particles may be soluble and others may coagulate. The Public Health Service recommends that samples obtained with the impinger be analyzed as soon as possible, usually within 24 hours of collection. It is felt that most mineral dusts of hygienic significance are not sufficiently soluble in such time to result in a significant loss of the sample. In our 12 years' experience with this instrument, we have had very little trouble with coagulation or flocculation.

The third objection is that it is not possible to count dust particles less than 0.7 to 0.8 μ in size. It is true that the microscopic technic used by us fails, in dealing with highly refractile dusts, to reveal particles less than 0.7 μ, but our work has shown that the number of such particles present in industrial atmospheres is comparatively small. Particle size studies conducted by us have shown that about 25 per cent of the suspended dust in the air is less than 0.7 μ. Moreover, it has as yet not been definitely established that these small size particles are of more pathological significance than those say from 0.7 to 3 μ. For these reasons, it is felt that our present technic reveals the significant size dust particles in the air of industrial establishments.

The fourth objection is that particle size determinations are not readily obtainable from impinger samples. Although in all such studies by us we have resorted to the Owens jet dust counter for particle size measurements, we have also had very little difficulty in preparing specimens for such measurements from dust collected by the impinger. This technic is described in *Public Health Bulletin No. 217.*

The statement that aggregates of particles which may exist in the air are broken and that solid particles are sometimes fractured when they strike the impinger plate, is not supported by proof.

The last objection, that the efficiency although high is not 100 per cent, cannot be considered seriously in view of the fact that independent research workers have shown that the impinger apparatus collects industrial dusts with an efficiency of 98 per cent plus.

It is apparent, therefore, that when judged in the light of the criteria suggested, the impinger apparatus is shown to be an excellent instrument for the purpose intended, namely, the evaluation of the dust hazard. Many years of use of this instrument, not only by us but by workers elsewhere, have shown it to be a device which can be employed for sampling in both high and low dust concentrations, with high efficiency, and the method of enumeration employed at present has been shown to be practical in that excellent correlations are obtained between the impinger dust results and clinico-radiographic studies of workers exposed to the dusts under consideration.

The electrostatic air cleaner described by Mr. Barnes, and which he developed for the purpose of obtaining large quantities of atmospheric dust for chemical analysis, will no doubt prove to be of value in certain types of investigations. However, as Mr. Barnes himself points out, in pneumoconioses studies it is more important to know the mineralogical composition of the dust than its chemical composition. In view of this, samples obtained with his device will be of little value, since it is well known that the small particles in the atmosphere are not capable of identification by petrographic technic. For this

reason, we have resorted to the collection of dusts settled at the breathing level, which contain not only the smaller size particles but also the larger ones, which settle out rapidly due to their size. Another objection to the air cleaner is that it also requires electric current. This is not available in many work places, such as in mines, quarries, etc.

Mr. Barnes's discussion on particle size presents an opportunity to express the speaker's opinion that the determination of particle size as a routine procedure in dust studies has been overemphasized. The reason for the average particle size being of variable value is not primarily due to the fact of personal error as Mr. Barnes says, but chiefly to the fact that even with the same dust, different sizes are produced by varying processes. For example, in working granite, a hand pneumatic tool will produce one average size, whereas the use of a machine pneumatic tool or a hand chisel will produce another average size. In other words, these variations are due to such factors, rather than different sampling methods or different microscopic technics. On the whole our measurements of thousands of particles of different dusts produced by various industrial processes have shown that although there is some variation, most of the dust particles (60 per cent) are between 1 and 3 μ in size. We have not found the filar micrometer method for such studies to be either tedious or difficult, and comparisons with photographic technics have shown it to yield comparable results. It is our feeling that all dusts present in industrial atmospheres are of a size small enough to gain access to the lung tissue, and that the important factors in the dust problem are the concentration and composition of the dust, and the years of exposure.

Should it be found that the dust determination method used by the Public Health Service is not revealing the significant sizes of dust, we would be the first to welcome any new device which might prove to be more efficient and better adapted for such studies. It must be borne in mind, however, that the instrument should be simple in construction and operation, and that the method of evaluation should be one which has small errors and is easily conducted. Mr. Barnes's electrostatic precipitator may have a slightly higher sampling efficiency than the impinger, but he has still to work out a method of enumeration which can be considered more practical than the present technic. In the final analysis, the method of dust sampling and counting which yields a practical index of the dustiness of an atmosphere is the one to employ. The instrument and method used by us over a period of many years has proved that high correlations may be obtained between dust counts in various industries and the degree of silicosis and tuberculosis among the workers exposed to the dusts investigated.

Fetal and Neonatal Mortality with Recommendations for Reduction*

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THE time from birth to 2 weeks is a unique epoch in the life of the individual. It is known as the neonatal period and during these days complete adjustment must be made from a sheltered intrauterine existence to one subject to the rigors of the external world. The causes of death in this period are largely distinct from those occurring later in life, but are closely allied with those operating as a cause of death before and during birth. For a complete understanding of the factors causing infantile deaths, study of antepartum and intrapartum deaths must be included.

At the Chicago Lying-in Hospital in Chicago there were 267 autopsies performed after deaths occurring in the first 10,000 consecutive deliveries, constituting 60 per cent of the deaths, and 61 per cent of the stillbirths. There were a total of 243 stillbirths after the 5th month of gestation and 198 deaths in the neonatal period, 75 per cent of which occurred inside of 24 hours, making a rate of 2.49 stillbirths per 100 live births and 23.9 neonatal deaths per 1,000 live births.

The most important causes of stillbirths are: asphyxia (38 per cent), due in large measure to placental and cord abnormalities and evidenced at autopsy by numerous petechial hemorrhages on the serous surfaces of the heart, lungs, thymus, liver, kidneys, or adrenals, together with marked engorgement of all peripheral vessels especially in the brain; intracranial hemorrhage (15 per cent), due almost invariably to birth trauma and demonstrated at autopsy by the presence of varying amounts of free blood in the intracranial cavity, either with or without falx or tentorial lacerations; major malformations (10 per cent). In only 1 case in this series could syphilis be proved the cause of death. In 22 per cent the fetus was macerated, indicating death some length of time before delivery but due to causes not determined. In 15 per cent there were no demonstrable abnormalities of any kind.

In neonatal deaths the most important factor is premature delivery of the fetus. In 32 per cent this was found as the only cause for failure to survive. Intracranial hemorrhage caused 27 per cent of the deaths, major malformations 12 per cent, asphyxia in which respiration was never established 4 per cent. In 10 per cent atelectasis of the lungs was the only

* Read before the Child Hygiene Section of the American Public Health Association at the Sixty-fourth Annual Meeting in Milwaukee, Wis., October 8, 1935.

pathologic lesion demonstrable and was listed as a cause of death. Although death is actually due to an insufficient gaseous exchange through the lungs the underlying cause is either depression of the respiratory center, lack of sufficient vitality to institute vigorous respiration or, more infrequently, inability to eject inspired amniotic fluid from the alveoli. Syphilis was proved in only 1 case, or less than 1 per cent.

By investigating the causes of death and by examining the summary in which they are listed according to the periods in which they operate, it may be seen that any effort to reduce neonatal mortality cannot be separated from the attempt to lessen the number of deaths in the ante- and intra-partum periods. The earlier in pregnancy death occurs, the less is known regarding the etiology and consequently the more difficult the problem of prevention. Abnormal development or faulty implantation of the ovum, abnormalities of the uterine mucosa, disturbance of ovarian or other endocrine function are the conditions usually surmised, but difficult to prove except in rare instances.

Later in pregnancy placental abnormalities are an important cause of death but impossible to prevent except in so far as in rare instances the child can be delivered by operative procedures when distress becomes apparent. Deaths from major malformations are inevitable and will always occur. They are due in large measure to abnormal germ cells and although various intrauterine conditions have been postulated as contributing factors none have been proved.

Of the known causes of death in the antepartum period those in which there is most hope of effecting a reduction are syphilis and the diseases specifically associated with pregnancy. Syphilis is a much more common cause of death in some areas than in others but it is the one condition which might be eradicated completely. Every woman should have a Wassermann test early in pregnancy. If it is positive or if there is any history of insufficiently treated syphilis, antiluetic treatment should be instituted at once. It is almost impossible to cure congenital syphilis after birth, but if treatment of the mother is started early in pregnancy the infant usually is free of the disease. Deaths from the various toxemias of pregnancy, including eclampsia, can be decreased by carefully watching the patient for impending development and instituting treatment promptly if symptoms occur.

In our present state of knowledge the entire attempt to lower antenatal mortality must be directed, with the exception of treating syphilis, toward general care and observation of the mother. She should be assured a diet adequate in calories, vitamins, and minerals, given adequate rest, and protected against emotional or physical fatigue. Any known endocrine abnormality should be corrected if possible. Medical examination should be sufficiently frequent to let no untoward symptoms go unnoticed. Examination should invariably include urinalysis and blood pressure estimation, together with the study of the general state of health.

In the intrapartum period by far the most common cause of death is trauma sustained during passage through the birth canal. Prenatal care should include taking accurate pelvic measurements and late in pregnancy determination of position of the fetus. If the measurements are adequate and the presentation cephalic with the occiput anterior, a normal delivery with a minimum amount of trauma may be anticipated. If the pelvic diameters are less than normal or the position any other than that stated, more trauma is apt to occur, the degree depending on

various factors concerned. In an anterior occipital presentation the plane of the head having the least circumference advances through the birth canal. In any other position a plane having a greater circumference must pass through and more molding must occur. When adequacy of the pelvis is questionable on manual examination, Roentgen measurements should be made. If the diameters are borderline, a test of labor may be given but if no progress is made a cesarean section must be done if the child is to be saved. When the measurements are definitely below normal, the infant should be removed by cesarean section before the onset of labor. If, when the patient goes into labor, the obstetrician is uncertain of the relation between the size of the fetal head and the maternal pelvis, he is under a great handicap in outlining his course if labor does not progress normally. If the fetus is battered against structures which it cannot pass untold harm is done both to it and to the mother.

In the interior of the head running longitudinally from the frontal region to the occiput is a downward midline extension of the dura known as the falx cerebri. In its posterior portion it is continuous with the tentorium cerebelli which lies at right angles to it and covers the cerebellum. Special reinforcing fibers are present near the free margin of the falx which divide at its posterior end and extend bilaterally along the free margins of the tentorium. Increase in any diameter of the head, especially if asymmetrical, causes tension on these free margins; if the tension is sufficient the fibers may part. Rupture occurs most commonly in the tentorium near the attachment of the falx and may be unilateral or bilateral. At the same time tears permitting extravasion of blood into the cranial cavity are usually produced in the sinuses coursing through these structures. Increase in antero-posterior diameter may cause rupture and hemorrhage from the great vein of Galen which is stretched between the straight sinus in the tentorium and the circle of Willis, even in the absence of sufficient strain to cause lacerations of the falx or tentorium.

Undue stretching of the structures within the cranial cavity is the usual cause of intracranial hemorrhage and is by far the most common type of birth trauma. By referring to the summary of causes of death, we find that it occurs in many conditions—with sudden change of forces on the head, as in precipitate deliveries, in very long labors where there is excessive head molding, and in breech presentations where there is often more compression of the head than it can tolerate. The most common cause is the application of forceps to the head and in this field improvement of obstetric technic holds forth the greatest hope for diminution of injuries. Forceps should not be applied without definite indications and then only by a skilled operator.

Other less frequent injuries causing death are fracture of the cranial bones, a separation of alar and basilar parts of the occipital bone with injury to brain substance by intrusion of the lower free margin of the alar portion, fracture of vertebrae, and rupture of internal organs with ensuing hemorrhage.

Although birth injuries can never be completely eliminated as a cause of death, improvement in obstetric judgment and technic may cause a marked reduction.

In the postpartum period the most common single cause of death is prematurity. Anything which will prolong the period of gestation to normal will increase the infant's chances of survival. Here again the most important factor is adequate prenatal care, although with the best of care and the most constant supervision, labor oc-

casionally sets in prematurely without a demonstrable cause. If it is deemed advisable to terminate labor, a viable infant cannot be obtained before the end of the 28th week, and even then it is very apt to perish. If an elective cesarean section is to be performed it should be done as near term as possible.

When an infant is born prematurely it must be very carefully protected. Maintenance of temperature must be begun from the moment of birth, and to conserve its energy feeding is best carried on by gavage. Mother's milk is the only satisfactory diet and should be obtained if at all possible. All external sources of infection must be eliminated. With skill and patience it is often possible to raise surprisingly small premature infants.

Death from birth trauma occurs usually in the first few hours after birth, and is similar in its etiology and manifestations to that occurring during delivery. If an infant is born alive but shows evidence of birth trauma it is treated the same as a premature infant in an attempt to prevent increased hemorrhage.

In the postpartum period, that time immediately following delivery is the most important. To give any infant the best chance for survival the normal temperature should be maintained from the moment of birth in order to prevent an initial chilling. The respiratory passages are freed of mucus and for this purpose a soft rubber catheter may be of great value. If respiration is delayed, administration of an oxygen (95 per cent) carbon-dioxide (5 per cent) mixture, together with artificial respiration should be used if available; otherwise, resort may be had to mouth to mouth breathing. Measures formerly in vogue, such as swinging the infant by the feet, tubbing alternately in hot and cold water, are more deleterious than helpful. Reasons for delayed respiration may be depression of the respiratory center due to interference with blood supply before or during birth, intracranial hemorrhage, aspiration of amniotic fluid, narcosis of the mother, etc.

Adequate care of the infant after it leaves the birth room consists in maintaining its normal body temperature, keeping it free from contaminating influences, and insuring it sufficient assimilable food. Breast milk is the most desirable diet but if this cannot be obtained in sufficient quantities, carefully chosen complementary food is added. The mouth and skin of the infant are very susceptible to infection. Swabbing out the mouth is apt to injure the delicate tissues and usually it remains in better condition if left entirely alone. The hands of the nurse are washed before the handling of each infant to prevent any possible skin contamination from one to another. Prevention of pneumonia, contagious diseases, etc., during the neonatal period is largely the same as with older individuals and consists chiefly in keeping the infant free from any possible source of infection.

SUMMARY OF CAUSES OF FETAL AND NEONATAL DEATHS

ANTENATAL PERIOD

Placental:

1. Abruptio placenta
2. Placenta previa
3. Massive infarction
4. Insufficient size

Cord:

1. Compression
2. Obstruction due to knots, thrombi, etc.

Maternal:

1. Toxemias, including eclampsia
2. Chronic degenerative diseases, such as cardiac decompensation, glomerulo-nephritis, etc.
3. Infectious diseases, including syphilis
4. Unknown causes which may be vitamin or mineral deficiencies or endocrine imbalance
5. Physical injury

TABLE I

PRIMARY CAUSE OF DEATH AND STILLBIRTH IN 267 NECROPSIES OCCURRING IN 10,000 CONSECUTIVE DELIVERIES

Cause of Death	*Premature*	*Term*	*Stillborn*	*Total*
Previability (no abnormalities)	15	..	..	15
Prematurity (no abnormalities)	25	..	..	25
Major Malformations	7	8	15	30
Asphyxia Total	1	4	55	60
Cause Undetermined	..	4	15	..
Toxemia and Eclampsia	..	..	8	..
Abruptio Placenta	..	..	20	..
Placenta Previa	..	..	6	..
Cord Obstruction	..	..	6	..
Plug in Bronchus	1	..	..	..
Atelectasis—Cause Undetermined	1	10	..	11
Hemorrhage				
Intracranial	13	19	21	53
Visceral	1	..	1	2
Maceration—Cause Undetermined	..	..	33	33
Miscellaneous				
Peritonitis	1	1	..	2
Syphilis	1	..	1	2
Congenital Fetal Hydrops	1	1	..	2
Pneumonia	..	3	..	3
Emphysema	..	2	..	2
Endocarditis (?)	..	1	..	1
No Abnormality	..	7	19	26
	66	56	145	267

Fetal:

1. Developmental abnormalities
2. Diseases specific to the fetus, as erythroblastosis with edema, osteogenesis imperfecta, etc.

INTRANATAL PERIOD

All conditions which produce fetal death in the antenatal period may also cause death during labor. In addition, there is the very important factor of birth trauma. Among the conditions under which it may occur are:

Spontaneous termination of labor:

1. Precipitate delivery
2. Prolonged labor due to such causes as an abnormal pelvis, disproportion between fetal head and maternal pelvis, posterior position of the head, premature rupture of membranes, etc.
3. Breach presentations in which there is too rapid head molding or too great pressure against the symphysis pubis
4. Difficult extraction of the shoulders with excessive traction or rotation of the neck
5. Rough handling of visceral portions of fetus during delivery

Operative termination of labor:

1. Application of forceps with too great or unequal pressure on the head
2. Version and extraction, for same reasons as in spontaneous breech deliveries.

NEONATAL PERIOD

Inability to become adjusted to an independent existence due to:

1. Any factor operating in the antenatal and intranatal periods, either alone or in combination with those below
2. Prematurity
3. Inherent constitutional weakness
4. Abnormalities, such as cardiac defects, gastrointestinal atresia, renal aplasia, etc., which were not incompatible with intrauterine life.

Conditions not intrinsically related to the establishment of an extra-uterine existence:

1. Acute infections of skin, mucous membranes, respiratory system, gastrointestinal tract, blood stream, etc.
2. Inanition due to improper or insufficient feeding
3. Insolation and refrigeration
4. Diseases peculiar to the neonatal period,

as hemorrhagic diathesis, icterus gravis, etc.

5. Miscellaneous diseases occurring in children and adults but rarely affecting the newly-born infant.

CONCLUSIONS

Although in the last 20 years there has been a marked decrease in the death rate under 1 year, there has been a smaller decrease in the death rate for the first 2 weeks of life. There has been practically no change in the rate for stillbirths since vital statistics on this subject have been collected.

Causes of death are best divided into those operating in the antepartum, intrapartum, and postpartum periods. In the antepartum period placental abnormalities, cord compression, developmental abnormalities of the fetus, and diseases of the mother incident to pregnancy are the most common causes; in the intrapartum period trauma with resulting intracranial hemorrhage is responsible for the majority; in the postpartum or neonatal period prematurity and birth trauma are the most common causes of death.

Attempts to lower the neonatal death rate cannot be made without also attempting to lower the stillbirth rate, for deaths in both groups are frequently due to the same fundamental causes.

The main points to be stressed in attempting to prevent antenatal, intranatal, and neonatal deaths are: better prenatal hygiene, immediate and appropriate treatment of toxemias, correction of malpresentations, appropriate treatment of cases of contracted pelvis, prevention of the onset of labor until as near term as possible, more skilled obstetric technic, and better immediate care of the new-born child, especially those born prematurely.

BACK NUMBERS WANTED

Readers of *The American Journal of Public Health* are asked to send spare copies of the following issues—

September, 1930
January, 1931
January, 1933

—to the American Public Health Association, 50 West 50th Street, New York, N. Y., as these issues are out of stock.

These will be much appreciated, and reimbursement of postage will be made in each case.

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THE PROBLEM OF THE VOLUNTARY HEALTH AGENCIES

RECENT statistics published in this *Journal* under the auspices of the Committee on Administrative Practice have made it clear that during the depression years, funds available for voluntary health agencies have decreased much faster than appropriations for official agencies. This must be a cause of grave concern since the voluntary health agencies, particularly the visiting nurse associations and preventive clinics, form an essential part of the public health program as a whole.

The health officer of a given community is the one person officially responsible to the people for the maintenance of its health services of all sorts. He should lead and direct the entire program, official and voluntary. If he is wise, however, he will in any given case utilize the particular agency which can carry on a given service most efficiently and most economically. In many instances, for example, the delegation of certain phases of public health nursing to visiting nurse associations which can carry such services on a generalized basis, has proved of great public benefit. Where this is the case it is entirely fitting and proper that such agencies should be aided by grants from the city treasury, made through and under the supervision of the health officer. If, however, the community through its voluntary funds does not make proper provision for its nonofficial health agencies, the health of the community will inevitably suffer.

It seems evident that in many communities throughout the country a more or less organized effort is being made to reduce the proportionate grants from Community Chest funds to the health agencies. This is in part a reflection of a general social viewpoint which favors the widest possible extension of government control in all fields. It is in part at least actuated by a desire to conserve Community Chest funds for the so-called "character building" agencies by shifting the health burden to the public purse. Although it is recognized that in many quarters the character building agencies may have been inadequately sup-

ported, we believe this tendency to reduce health agency support to be unwise and unfortunate. It may well be maintained that the care given to infants and young children by the public health nurses and the child health conferences definitely affects character building, just as do those institutions which provide leisure time activities in later life. All of us who are interested in the public health field should strive to see that the health agencies are not forgotten in the Community Chest program of the future.

TYPES OF THE DIPHTHERIA BACILLUS

IN 1931,[1] Anderson, Happold, McLeod, and Thomson devised a chocolate agar tellurite medium for the growth of the diphtheria bacillus, and by its use were able to divide the Klebs-Loeffler bacillus into three types—*gravis*, *mitis*, and "intermediate." They based their nomenclature on the relative severity of cases from which these types were isolated. Since that time a great deal of work has been done in England, which has in the main confirmed their findings, especially as regards the cultural characteristics of the three types of organism isolated. However, the findings concerning the type of cases from which these three varieties are isolated have been decidedly different.

The matter has been of sufficient importance to attract official attention, and in our review of the *Annual Report* of the Chief Medical Officer of the Ministry of Health for 1934,* we commented on some of the results. This report took up work done in London, Staffordshire, Edinburgh, Glasgow, Manchester, Hull, and other places. In certain articles it is stated that the clinical type due to the "intermediate" form is "only a little less severe" than that produced by *gravis*. Mild cases are observed from which either *gravis* or *mitis* are isolated and are clinically indistinguishable. In Hull and Leeds the *gravis* strain predominated. In Glasgow it was rare and *mitis* was common, while in Manchester the "intermediate" strains were most commonly found at the beginning of the study, but gave way later to *gravis* and *mitis*. In Staffordshire there was difficulty in classification, owing to the prevalence of atypical strains. In Edinburgh atypical strains were found, but were replaced later by "intermediates."

The correlation of the bacteriological findings with the clinical characteristics has, in the main, confirmed the original findings, though there have been many marked differences. In Manchester and Leeds the "intermediate" strains give a disease less severe than that produced by *gravis*, while in Hull, the "intermediate" strain shows a severity definitely between *gravis* and *mitis*. In London there was no evidence that the severest types of the disease were associated mainly with *gravis*, though later in the investigation an increase in the severity of the disease was noticed, and an increase in the prevalence of *gravis* strains was found.

The latest study[2] that has come to our notice is from Leeds, the city from which the original work emanated. Here again, the bacteriological findings agreed with those reported by the original investigators. There were no aberrant strains found and the "intermediate" types were 100 per cent typical. The report embraces 166 virulent strains isolated from typical cases of diphtheria occurring in Dundee and the surrounding district. The author, Dr. Murray, had 71 of these cases under his personal care. All the cultures fell clearly into one

* *A.J.P.H.*, Jan., 1936, p. 76.

of the three classes; 66 *mitis*, 10 *gravis*, and 90 "intermediate." Of the *gravis* strain, 9 out of the 10 were isolated from mild cases, while the greatest majority of the severe cases were due to the "intermediate," the case mortality for this strain being 11.1 per cent against 3 for *mitis*, and 0 for *gravis*.

There can be little question that the work of Anderson, Happold, McLeod, and Thomson has a real public health significance in addition to its scientific interest. The difference in findings referred to points clearly to the need for further investigations in a number of different places in England as well as in other countries. Ever since diphtheria has been known we have recognized that some epidemics are more severe than others. In recent years several epidemics of extreme severity have been reported without any clear reason for the unusual virulence shown.

Ever since the discovery of diphtheria antitoxin by von Behring, in Germany, and Roux, in France, we have reposed serene in the belief that antitoxin was the sovereign remedy, and nothing said here is intended to question the fundamental soundness of this belief. Indeed it is strengthened by the work discussed, at least as far as experiments on animals go, since the antitoxin in general use has been found to neutralize the toxin of *mitis*, *gravis*, and "intermediate" types. In human beings, cases from which the *gravis* is isolated do not respond favorably to the use of antitoxin, while those due to *mitis* and "intermediate" are favorably influenced.

NOTE: The authors of the original paper stressed only the *mitis* and *gravis* forms which they spoke of as the "two principal forms of the diphtheria bacillus." They, however, recognized the "intermediate" form in from 5 to 10 per cent of their cases. It is of especial interest to note that the organism known as Park No. 8, which is so widely used in this country and others for the production of diphtheria antitoxin, and is famous for its consistent production of a toxin of high potency, falls into this group.

REFERENCES

1. Anderson, J. S., Happold, F. C., McLeod, J. W., and Thomson, J. G. *J. Path. & Bact.*, 34:667, 1931.
2. Murray, J. F. *J. Path. & Bact.*, 41:97–106, 1935.

PUBLIC HEALTH EDUCATION*

"Village of the Living Dead"—"Hundred of Miners' Lives Reported Lost from Silicosis, Occupational Disease; Congress Stirred; Employers Deny Unfairness."

Thus the *Literary Digest*, 354 4th Ave., New York, N. Y. (Jan. 25, 1936), presents to its readers the story of disease and death at Gauley Bridge, W. Va.

New York World-Telegram had pictures and a striking Rollin Kirby cartoon. Probably newspapers over the country carried news of the House committee hearing in Washington. And thus a public health situation was in the news.

Did any public health workers get any tie-up for a local dust and disease problem?

When Publicity Back-fired—In all probability Columbia University overplayed the announcement of the dental desensitizer which was in all the newspapers about a month ago. Dentists' patients have been led to expect far more than there is reason to believe the new formula can accomplish. At the best its practicable range of use seems to be far more limited than will be generally believed.

Dental groups may be counted upon for authoritative statements as quickly as the formula and technic for its use are adequately checked.

"The Great Destroyer of Life"—Under this title, Dr. J. D. Dowling, Health Officer, Jefferson County Board of Health, broadcast over Station WAPI, on January 16, 1936.

The significance of this event is the fact that in a 3 page talk, "syphilis" or "syphilitic" was mentioned 19 times, and "venereal" 4 times. Not once was "social disease" mentioned. "Ethical morality" and improvement of "the ethical and physical fiber of mankind" were advocated as well as medical prophylaxis.

The presentation was devastating in its picture of widespread significance of the disease.

Misrepresenting a Public Health Situation—Does not "social diseases" imply a moral rather than a public health problem?

When public health workers use the term are they handicapping a public health attack upon disease?

Writing for Listeners—Nine years of experience with one type of daily program is the background for an article on "Writing for Listeners," by H. C. Douglass. *Journal of Home Economics*, Mills Bldg., Washington, D. C. Nov., 1935. *30 cents.* Although written in terms of home economics our readers may readily broaden the application of several quotations:

> First, about selecting a topic. In general, a good rule seems to be to choose a small, specific subject rather than a broad, general one. The human mind can hold only so many ideas at a time, and its capacity is considerably cut when it is already partly taken up with the baby and the broom. Most effective radio talks are appetizers rather than full meals. They don't satiate the listener with so many nourishing facts that none has flavor; rather, they serve up one zestful bit of information that makes the

* Please address questions, samples of printed matter, criticism of anything which appears herein, etc., to Evart G. Routzahn, 130 East 22d St., New York, N. Y.

listener want to taste more. For example, a talk on modern scientific methods of canning is less likely to hold interest than one on the safe canning of the corn ready in the garden. The listener who finds this small definite piece of canning information valuable will want more when her other vegetables are ready to can.

As for the writing of the talk, no hard and fast rules exist, except the general rules of all good writing. A clear, pleasant, enthusiastic voice will often make dull script go over fairly well. But anyone who has the job of preparing radio talks for the average voice soon finds little writing tricks that make any talk more effective.

The style that has proved most successful over the air is simple, natural, and conversational, no matter how scientific the subject. That means simple, familiar words with the fewest possible technical terms, and it means short, easy, straight-forward sentences.

Just why so many home economics speakers avoid this simple style is a question. Radio managers say that scientists and teachers generally don't make interesting talks if left to their own devices. The scientist in front of the microphone is likely to talk as if he were addressing a learned scientific meeting, and the teacher as if she were in the classroom instructing the ignorant young. In fact, one well known radio director declared some time ago that it was easier to get a good talk over the air from a cowboy or a backwoodsman than a Ph.D. People without the so-called higher education often are able to express themselves more naturally and colorfully than those of us whose vocabulary has been changed by scientific and educational training. An unschooled person often knows all the tricks of good story telling and also knows how to use words to build a clear picture for his listeners. The village gossip talking over the back fence about the house-cleaning demonstration may give her neighbor a better picture of house-cleaning methods than the specialist herself could if she had only words to rely on.

When writing a radio talk one

. . . needs to come out of the laboratory and classroom and imagine that she is on her neighbor's porch just talking. She may have news to report, a story to tell, or advice to give. As a radio speaker she is a guest in her listener's home, and she must be a welcome guest if she wants to stay there long enough to finish her conversation. So she takes pains to make her talk interesting, cheerful, sympathetic, and not too long-winded.

Straight-forward statements help to hold attention.

The scientist or the textbook may say, "The study was made," but the radio writer will say, "I made it" or "We made it," or "She made it."

The first paragraph must win the listener.

The tendency in writing this paragraph is to make a formal introduction with a lot of vague generalizations on all phases of the subject—to beat around the bush instead of plunging in. This kind of a first paragraph is ideal for driving listeners away. A good start may be a bit of lively news or an anecdote or some quip to put the listener in good humor, or simply a statement of what the topic is and perhaps also why it was chosen. The important point is to catch the listener's interest. Then, the succeeding paragraphs develop the topic.

A usable reading list accompanies the article.

"Photographs Please!" — Thus pleads N.O.P.H.N. which has received numerous requests for photographs from writers, editors, visiting nurse associations, and other groups.

It has not been possible to keep an up-to-date, attractive supply of photographs on hand. Yet to represent public health nursing pictorially in an adequate way is surely a responsibility of the N.O.P.H.N. and it disturbs us when we are unable to fill requests and to know that the picture of the nurse that is finally published for nation-wide distribution may be totally wrong—a nurse in white, a nurse in high heels, a nurse sitting on the patient's bed, a nurse in uniform—smoking—all of which we have seen recently.

Will you share your pictures?

If you have any clear, glossy prints of the public health nurse at work—in office, home, clinic, school, industry, or just "on the way" in city or country, may we have a copy? If it is a picture we can use and if you have gone to any expense in getting an extra copy for us, we will gladly pay for it, and we will publish the names of contributors to this cause! With the picture will you please send us the following information:

(1) May we use the picture for publicity

purpose without credit to your organization? If not, how do you want the credit line to read?

(2) May we cut off some of the picture if only a part of it is needed?

(3) Is there a charge for the picture?

(4) Has the picture been used in any newspaper or magazine of wide circulation? If so, permission to use it must be obtained from the publisher.

Please send your pictures to the National Organization for Public Health Nursing, 50 West 50th St., New York, N. Y.

We quote all this because it applies equally to all phases of public health. *Much additional national as well as local space for public health topics could be secured if state and local agencies would send photographs to the nationals.* Acceptable photographs would float many a useful article. Many photographs could be used with captions only.

And numerous photographs could be used in other cities in place of local pictures. Of course, in such cases the users will carefully avoid giving any impression except that the photographs are typical of local people or conditions.

If you happen to have a photograph and you do not know where it would be useful, please mail to editor of this department who will pass it on to good advantage.

Please note the four items of information requested by N.O.P.H.N. We would add two requests for information:

(5) Can you supply additional prints (preferably glossy and unmounted)?

(6) Please give all the explanatory detail possible for each photograph.

A Tabloid Presents Venereal Diseases—The *Daily News* of New York City, with the largest newspaper circulation in North America, ran 4 full page articles on v.d. in the first week of February. Here are sample headings:

PARASITES OF MEDICINE. *Charlatans Prey on Seekers of Health.* Quackery is exposed in today's story on venereal diseases. It also frankly discusses prevention, symptoms, and treatment.

MAYOR AIDS DISEASE DRIVE. *City to Launch Anti-Venereal Campaign.* What is New York City doing to combat venereal diseases?

Here are the lead paragraphs of the first and last of the articles.

While you read this sentence more than one million men, women and children in New York City are suffering from venereal diseases. Syphilis infects about 378,000, and gonorrhea twice as many. The nation's victims total at least 19,000,000, or 15 per cent of the population.

Mayor LaGuardia sounded the call to arms yesterday for a conquest of syphilis and gonorrhea. In curt, steel-edged words he called on New Yorkers to mobilize for a city-wide anti-venereal disease crusade led by the Department of Health.

Millions for Health Education—Millions of pieces of printed matter were distributed by tuberculosis associations in 1935.

Exclusive of the Christmas Seal Sale the National Tuberculosis Association published 4,125,454 pieces at a cost of $23,501.07. Excluding 1,600,000,000 seals, the supplies for the Seal Sale totaled an additional 22,645,728 pieces, and the total cost was $112,905.93.

The publications included one book, 5,238 copies; 8 monographs, 22,030 copies; 9 pamphlets, 262,595 copies; 21 circulars, 660,672 copies; 32 reprints, 63,546 copies; 31 miscellaneous and unclassified publications, 219,171 copies; and 12 different Early Diagnosis Campaign publications, a total of 2,892,159 copies.

Not included above are the *American Review of Tuberculosis*, the *Tuberculosis Abstracts*, the monthly *Bulletin*, the *Journal of the Outdoor Life*, the monthly *News Letter* and the annual volume of *Transactions*.

Pasteur on the Screen—"The Story of Louis Pasteur," produced by Warner Brothers, is reviewed by Frank S. Nugent in *New York Times*. Feb.

10, 1936. The *Times* can be found in many public and college libraries.

The dramatic department of the *Times* confesses to heresy. As Mr. Nugent says:

It believes that accuracy is not the most important part of biography. It will accept errors of time and place cheerfully, and it will condone the addition of known fiction to known fact provided these untruths are committed in the interests of a greater truth, which would be the preservation of spirit—not the chronological letter—of a man's life.

"The Story of Louis Pasteur" telescopes the French scientist's years and highlights his achievements. It embroils him in a prolonged feud with the French Academy of Sciences and its president. It has him incur Napoleon III's displeasure and virtual banishment from Paris. It delays his recognition until the evening of his life. It portrays him as a model of scientific detachment, the laboratory method personified, a modest, academic, self-effacing man.

Most, if not all, of this is against the weight of such biographical evidence as one might encounter in staid Britannica or in the more lively pages of Paul De Kruif. And yet, possibly because we have heretical notions, we believe that Warners' "The Story of Louis Pasteur" is an excellent biography, just as it is a notable photoplay, dignified in subject, dramatic in treatment, and brilliantly played by Paul Muni, Fritz Leiber, Josephine Hutchinson, and many other members of the cast.

Advising versus Educating—For a full perspective read "The Nurse's Opportunity to Teach Parents," by W. Rand. *Public Health Nursing*, 50 W. 50th St., New York, N. Y. Nov., 1935. *35 cents.* But here is set forth the difference between advising and educating.

It is easy for the nurse to give advice; it is much less easy for the nurse to teach. "You ought to bring your baby to the clinic, Mrs. Brown, to see the doctor." Quickly said, often *not* acted upon, perhaps many times acted upon because a personal relationship, valuable in many ways, has been established between the nurse and Mrs. Brown. Mrs. Brown brings the baby to the clinic because she likes the nurse and wants to please her, although she may not continue to do it when the nurse moves to another district. But is that education? No, that in itself is not education although it may be a first step, for education may result from the experience of the clinic and later contacts. Much less easy, more time consuming even, is it to give uneducated Mrs. Brown some understanding of what the clinic may mean for her and her baby. There must be the marshalling together of facts which the nurse has and which perhaps are only available to Mrs. Brown through the nurse, and the presenting of them in such a way that Mrs. Brown understands them and realizes that they apply to her and her baby, that they are of real significance to *her*. Conviction which leads to action is not just an intellectual process. There is something of an emotional coloring, a feeling tone which is a necessary part of the process and must not be ignored. One can intellectually agree to the reasons why adequate rest is important but one will not take adequate rest until one *feels* one needs it, until the intellectual process has taken on that emotional coloring which means a result in action.

"To Contact" or Not "to Contact"—Shall we contact people, or shall we use a verb which is accepted as such by dictionaries and grammarians?

Shall we write and speak English according to the rules, *following* the crowd only when by crowd usage a noun has become a verb as well?

Or shall we speak and write according to our own convenience, whether or not English purists agree with some of our usage?

School Lunches in Massachusetts—In that state the Federation of Women's Clubs, Red Cross chapters, Selectmen's Association, Consumer's League, American Legion, Boy Scouts (note the range of the coöperating groups), as well as the Departments of Education and Extension, have worked with the Department of Health on a school lunch survey, and the improvement of school lunches in the state.

What was done and much of what

was accomplished is reported in "The School Lunch Survey in Massachusetts," by H. I. Duff, in *Journal of Home Economics*, Mills Bldg., Washington, D. C. Nov., 1935. *30 cents.*

Among the contributory services were panel discussions of selected groups in Boston and in Springfield. A week's summer conference on management was held.

During the last year the Department of Public Health has sent out various bulletins, papers, posters, and other lunchroom helps for teachers, lunchroom managers, school principals and superintendents, nurses, and community organizations. It has also arranged for radio talks and newspaper and magazine articles to increase general interest in and understanding of the school lunch program.

Teaching the Tb. Patient—This is the subject of *Tuberculosis Abstracts* for March, 1936.

When the doctor secures the admission of his patient to a sanatorium his primary object is to secure optimum conditions under which the repair of the damaged lung may be effected. But he has every right to expect also that the sanatorium perform another function which is sometimes overlooked or done in a perfunctory manner, namely, education of the patient. The following abstract of a paper, originally addressed to sanatorium physicians and their staffs, will interest also the general practitioner.

". . . the superintendent of the sanatorium should be, in effect, educator as well as doctor. Every one of his assistants, nurses, orderlies, and servants is a teacher under his supervision and shares with him the responsibility.

What should the tuberculous patient be taught? His curriculum might be divided into three main groups: (1) a way of life, (2) an understanding of tuberculosis, particularly *his* tuberculosis, and, (3) knowledge of how to protect others."

Dr. H. E. Kleinschmidt, the author, says:

The third broad grouping of the patient's training has to do with the prevention of the spread of his disease. Furnishing a patient with a sputum cup and installing an incinerator may be the alpha of prophylaxis, but it is not the omega. He should learn of course why such scrupulous attention is paid to sputum disposal. But he should learn also the numerous ways in which tubercle bacilli migrate from one person to another. He should develop automatic habits of safety—something akin to the surgeon's "aseptic conscience." To learn by rote that kissing, spitting, the use of common eating utensils, etc., are "verboten," as well but not enough.

It is better to teach simply and clearly the general biology of the disease, the manner in which the germ gets from one person to another, and how it does its deadly work. Give the average person an understanding background and a few specific examples, and he will, himself, regulate his conduct to the best interests of others and his own good.

From an understanding of his own tuberculosis and the desire to avoid infecting his loved ones and friends, is but a short step to the cultivation of an interest in the larger problem of combating the pandemic, tuberculosis. Every patient who leaves the sanatorium should have a good grasp of the broad epidemiologic picture of tuberculosis. The graduate of a sanatorium should be a crusader striking his blows in season and out of season. In him burns an everlasting fire. There are thousands like him. Against the cumulative effect of such force the old, old enemy is bound sooner or later to crumble.

For a copy apply to any tuberculosis association.

Need for Education: Baltimore Speaking—The occasional use of polluted water for drinking purposes is one illustration of the following statement in *Baltimore Health News* (Oct., 1935):

In each community there are certain health hazards which cannot be readily controlled or eliminated by the health department, but which can be avoided by the citizens themselves providing the dangers have been pointed out. If the public understands and coöperates in taking the precautions that may be necessary, those menaces which are less amenable to health department control can be mitigated to a far greater extent than is otherwise possible. Public health education or teaching the lessons of how to keep well is thus a vital function of the health department which should seek by all possible means to teach the public how to guard against health dangers.

Need for Education: North Carolina Speaking—Fantastic "cures" are described in *Health Bulletin*, North Carolina State Board of Health (Sept., 1935), with this statement by the editor:

In the recent epidemic of infantile paralysis, or poliomyelitis, the officials of the State Board of Health have learned a good many things. Some fundamental scientific facts were reëmphasized and stressed anew, and some old fakes which have been operating for many years took on new life. Out of it all one thing seems clear, and that is, the need for better scientific education in the high schools of the state on such matters of everyday importance as the prevention and the spread of disease, also the great need for a better informed public and a more discriminating one when it comes to appraising the value of the thousand and one remedies offered for the most part by people who are totally ignorant of the diseases for which they have cock-sure cures.

Same Slogan, But Different Emphasis—The 1936 Early Diagnosis Campaign of the tuberculosis associations will repeat the slogan of last year: "Fight tuberculosis with modern weapons." Last year the "weapons" discussed were the elements in treatment. In 1936 the presentation will return to early diagnosis as a chief weapon.

We shall retell it with a new inflection and emphasis, and we shall include in our story what is not yet generally known, namely, that the doctor today is able, because of modern weapons, such as the X-ray, to be more precise in his diagnosis than was formerly the case.

A second aspect of the theme to be developed will be that of anticipating tuberculosis before any symptoms appear. To go to the doctor promptly because of a cough that hangs on, loss of weight, or fatigue, is good; to go to him before these evidences of actual danger appear is still better. It pushes the fight back nearer to its source. Modern weapons, such as the tuberculin test and the X-ray, together with modern ways of using these weapons practically and economically must be made known to, and accepted by, the people if we are to clinch the fight. Tuberculosis is still the chief cause of death in the productive period of life—15 to 45. Routine search for early symptomless tuberculosis among students of colleges and high schools and among young people in industry, is the key to the attack in this sector. In this campaign we wish to make the procedure of routine examination with the tuberculin test and X-rays known to parents, educational leaders, doctors, and all who are concerned in the welfare of young people.

The Health Education Committee urges that the E.D.C. be considered as an all-year educational project and not limited to 1 month's activity. Plan your campaign carefully now and if possible lay out a calendar schedule.

Folders and pamphlets, posters, and other supplies will be available through the state tuberculosis associations.

The National Tuberculosis Association will, as in previous years, further the campaign through national channels. Articles will be released to national syndicates; magazines will be offered special articles and cuts; national radio broadcasts will be given. Samples of the booklets will be sent to state health officers, together with a letter soliciting coöperation.

The National Association will also furnish, from time to time, mimeographed material consisting of newspaper articles, radio talks, and other aids. Each month, beginning with April and ending with September, such "publicity kits" will be sent to the state association.

The announcement of the campaign advises that states "order with discrimination." Our suggestion is discrimination against use of the newspaper and magazine cut offered for the campaign. It seems to suggest the nightmare of a patient afflicted by aggressive modern weapons.

Contests in Minnesota—First, there was the 1935 Radio High School Public Speaking Contest. This was the fifth annual contest sponsored by the Minnesota Public Health Association, the Woman's Auxiliary of the Minnesota State Medical Association, and Station WCCO, as a part of the Christmas Seal educational campaign.

Local preliminary contests resulted

in 108 high schools each sending a talk for the state contest. Of these, 10 were broadcast over WCCO, and the manuscripts of 13 others received honorable mention.

Second, was the contest for a cover design for *Everybody's Health*, published by the same Minnesota Public Health Association, St. Paul. The 150 entries came largely from schools, although the ages of contestants ranged from 7 to 76 years.

A School Health "Thermometer"—From Celia Moore, Division of Child Hygiene, Texas State Department of Health, Austin, comes a mimeographed description of a device for enlisting teachers and pupils.

An easily made "thermometer" registers group and individual credits which cover minimum essentials in health training and instruction, control of communicable disease, school plant and equipment.

The device and its uses are easy to understand as described in detail.

Massachusetts Cancer Program—This is the title of a new 6 page pamphlet from Massachusetts Department of Public Health, Boston. The program:

> Statistical studies; clinics; hospital; education.

The education program is described as follows:

> In order to carry out our instructions to disseminate knowledge to every individual in the state a coöperative cancer control committee is either established or is in the process of being established in every one of the more than 350 communities. This committee is composed of a small central group or steering committee, and a larger group contacted directly by the central committee, and finally, every individual in the community. The steering committee is composed of key people who have friendly and vital contacts with every type of group and individual represented in the community—religious, political, labor, foreign, social, fraternal, patriotic, and service. The members of this steering committee contact representatives of every club in the community. These clubs promise to have at least one meeting a year on cancer. A club does not have to have an impressive membership to become corporate in this plan. The small group of 8 or 12 is an ideal size. The group, itself, determines the type of cancer talk it will have. Some groups prefer a formal talk followed by a question period while others prefer the round-table discussion with the physician during which questions are asked. In any case a question period is desirable. It is at these small group conferences where an individual feels free to ask questions about cancer where the real basic educational work is done.
>
> The local physician is the one who is asked to be the teacher in this program because the decline or increase in early detection of cancer is entirely in his hands, because he will obtain more coöperation from his community if it knows exactly what to do in case of early symptoms and what the early symptoms are, because the local physician knows his community, and because it has always been the natural prerogative of the physician to teach.
>
> The accompanying chart shows the organization of a coöperative cancer control committee in a city of 50,000 or over. With some modification, this plan can be extended to include the smaller communities.

Printed matter is offered; radio broadcasts are given at irregular intervals; a monthly bulletin is available to physicians.

Physicians Lecture on Public Health—The sixth annual series of free public health lectures has been given in Cleveland by the Albert Fairchild Holden Foundation and the Academy of Medicine of Cleveland. Topics:

> Mentality and crime . . . High blood pressure . . . The relation of teeth to health and appearance . . . The crippled child.

State Department House Organs—House organs or periodical bulletins reach us from 19 states. They are issued weekly, twice a month, monthly, bi-monthly, or quarterly. Printed or

mimeographed, they run from 4 to 40 pages an issue.

The popular printed page sizes are 6 by 9 inches, and 8½ by 11 inches, but there are many differences in looks and in quantity of material carried.

Their functions, as expressed by the contents, are diverse, or in a few cases, not obvious to the outsider.

Massachusetts, Texas, and the Philippines will be mentioned later. We do not receive the bulletins issued by New York, Florida, and possibly others not listed here.

Arizona: "The welfare of the people is the supreme law." The January issue contains a discussion of water analysis, and statistical tables. Monthly, 4 pages.

California: Recent issues have included a leading article: Psittacosis, bodily resistance and lowered vitality, health and government, or coccidioidal granuloma, etc.; weekly morbidity reports; brief official notices, or other health news, or quotations. Weekly, 4 pages.

Connecticut: "For a clean state and a healthy people." January issue contains reports of two radio talks; several official statements; statistical tables; topics of popular broadcasts for the month. Monthly, 20 pages. (32 pages in December.)

Illinois: February 1 issue contained brief articles, based upon state statistics, on hazards to male and female, physical efficiency, smallpox in Illinois, tuberculosis in cattle, babies fared well last year, the cost of safeguarding milk, the enigma of tuberculosis, together with a limited mortality table. Semi-monthly, 4 pages.

Iowa: The Oct.-Dec. issue is devoted to "The control of tuberculosis in Iowa," covering both the public and the private agency program. Quarterly, 20 pages.

Kentucky: Nearly every issue carries a photograph or cartoon sketch on the cover page. January issue presents infant and preschool child health conferences, social hygiene in the health program, anterior poliomyelitis in Kentucky during 1935, restaurant pests and their control, typhoid carrier work in Kentucky, along with brief information and news paragraphs. Monthly, 12 pages.

Maryland: February issue is devoted to 1935 mortality reports. Monthly, 8 pages.

Michigan: December issue includes articles reviewing 1935, what mental hygiene has to contribute to the understanding of children, whooping cough (diagnosis and control), index for the year, condensed mortality tables. Monthly, 20 pages.

New Hampshire: January issue covers the need of restriction on excessive drafts of water from lakes and ponds, artificial coloring of oranges, government investigation of manufacture of orange beverage bases, artificial color in orange juice drinks deemed an adulterant, Hinton test for syphilis, statistical report of maternity, infancy and child hygiene, and the quality and selection of toilet tissue. Monthly, 12 pages. (New Hampshire usually gives more attention to food and drink than do other states.)

New Mexico: December includes a brief holiday message, the state director's page, the bureau of child welfare, the rôle of the nurse in communicable disease control (from New York State), district health officers' conference, news items about nurses with magazine references available through the Nursing Bureau Loan Library, the community sanitation program, a letter reporting a piece of local health work, and several news paragraphs. Monthly, 9 pages, mimeographed.

North Carolina: "This Bulletin will be sent free to any citizen of the state upon request." January issue contains material on mental health, gen-

eral hygiene and mental hygiene (11 pages from Iowa bulletin), unavoidable (?) accidents (newspaper editorial), and a statement about early diagnosis and treatment of syphilis. As is usual, a photograph appears on the cover page. Monthly, 16 pages.

Ohio: January 15 issue includes the usual column of brief paragraphs ("The Line O' Light"), chicken pox a differential problem, fads and fancies in diets usually dangerous to follow, broadcast topics for month ahead, scarlet fever control tried through cultures, vitamins are a vital aid in the control of rickets, boy coaster overcome by carbon-monoxide fumes, carbon-monoxide poisoning makes a big jump in Ohio, call issued for papers for state medical meeting, sanitary engineering actions taken in December, several paragraphic fillers. Semi-monthly, 4 pages.

Oregon: Two inside pages give weekly morbidity reports by counties, and two outside pages present objectives of mental hygiene, chicken pox, scarlet fever, or other subject. Weekly, 4 pages, mimeographed.

Pennsylvania: "This journal is free to the people of Pennsylvania. A request to the Editor will bring a copy of this magazine to your home without charge." Nov.-Dec. issue carried an editorial on human hibernation, nutrition-calories-costs, the Health Gnome Says (as usual), the polio problem, what housing means to health, the narcotic problem, the Christmas Seal, Department news, and vital statistics comment. Many illustrations. Bi-monthly, 40 pages.

Tennessee: November issue carried articles on plans for increased immunizations, tuberculosis in Tennessee, and malaria control. Monthly, 4 pages.

West Virginia: January issue has New Year verses, a review of 1935 by Department divisions and bureaus, explanation of new state laboratory ruling, staff changes, state news, quotations from President Roosevelt applicable to health workers, announcements of professional institutes. Monthly, 5 mimeographed legal size sheets unstapled.

Wisconsin: Oct.-Dec. issue included public health strides promised through new state legislation, supervision of well drilling a new state function, new legislation for barbers, hotels, and restaurants, classification and pathogenicity of certain yeast-like fungi with special reference to monilia, industrial waste treatment, CCC camps as body and morale builder, sanitary engineering report, health work among Indians, newspaper editorials quoted, communicable disease mortality comment, quarterly mortality report and informational fillers. Quarterly, 32 pages.

DATES AHEAD

March, 1877: "the first visiting nurse started her rounds to the sick poor."

March 29–April 5: National Negro Health Week. Address: National Negro Health Week, U. S. Public Health Service, Washington, D. C.

April 1, April Fool's Day: An opportunity to remind the public of the many people who fool themselves in health matters?

April 12: "the first dispensary opened its doors in Philadelphia in 1786."

April 15: incorporation of National Child Labor Committee in 1904.

April 25–May 2: National Boys' and Girls' Week. Address: at 35 E. Wacker Drive, Chicago, Ill.

April 26–May 2: Better Homes in America Week. Address: in care of Purdue University, West Lafayette, Ind.

May 1: May Day-Child Health Day. Address: your state department of health.

Detailed suggestions for use of above

dates will be found in "News Almanac for Social Work." Community Chests and Councils, 155 E. 44th St., New York, N. Y. *50 cents.*

NEW

Health Officers News Digest, Public Health Committee of the Cup and Container Institute, 30 Rockefeller Plaza, New York, N. Y. "Readers are frankly warned that this publication is propaganda," says Editor Homer N. Calver. Health workers will wish to see a copy.

RADIO

Usually health workers may secure mimeographed copies of broadcasts via Illinois, Baltimore, Connecticut, and Jefferson County.

American Medical Assn. has been changed from the Blue to the Red network of NBC, via WEAF, and certain additional stations, at 5 P.M., eastern standard time, and Pacific network at 2 P.M., Pacific time. This is a dramatized program with incidental music under the general theme of "Medical Emergencies and How They Are Met." Some of the programs are broadcast on short wave through KDKA, Pittsburgh, over W8XK, 11,870 and 12,210 kilocycles. Recent topics have been:

Common household emergencies . . . Tuberculosis . . . Hunting accident . . . Infantile paralysis . . . Diphtheria . . . Scarlet fever . . . Health of the traveler . . . Pneumonia . . . Little tips on home hygiene . . . Heart disease.

Baltimore City Health Department (Tuesdays):

Figures that talk (vital statistics for 1935) . . . Winter sports, exercise, and keeping well . . . Through a pasteurizing plant with a milk inspector . . . Health and physical education in the public schools.

Connecticut State Dept. of Health (WTIC, Thursdays at 1:25 P.M.):

Focusing on the disease germ (what the laboratory reveals) . . . Pneumonia . . . Reducing health hazards in industry . . . Water pollution and the public health . . . Studying the cancer problem . . . Habits which cause irregular teeth.

Illinois State Dept. of Health (WGN, Mondays; WHFC, Saturdays):

No one need die of tuberculosis . . . A new problem of public health workers (diabetes) . . . The new science of phenotypology in medicine . . . Every man his own quack doctor . . . Yesterday and today in medicine . . . Echoes of world war enemies (trench mouth) . . . Outstanding progress in medicine in 1935 . . . Science progresses in brain knowledge . . . The newer "magic" of medicine and heart disease . . . Health today and tomorrow.

Jefferson County Board of Health, Birmingham (WAPI, Thursdays at 10:15 A.M.):

Bedtime for school children . . . The great destroyer of life (syphilis) . . . On catching a cold.

Minnesota State Medical Assn. (WCCO, Minneapolis and St. Paul, every Monday at 10 A.M.):

Value of colonic irrigations . . . Toothache . . . Diet and health . . . Care of the eyes.

Ohio State Dept. of Health (WOSW, Tuesdays at 2:30 P.M.):

Analysis of the annual occupational disease report . . . Population changes as indicated by vital statistics . . . Scarlet fever.

BOOKS AND REPORTS

Immunology—*By Noble P. Sherwood, Ph.D., M.D. St. Louis: Mosby,* 1935. 600 pp. Price, $6.00.

The book is written for medical students and others of comparable background and has developed from mimeograph forms used in such classes. All of which may account for the practical and usable nature of the material presented. A tremendous lot of information is crowded into a relatively—according to present-day standards—short book. It is information concisely and simply presented and arranged in such a fashion as to enable the reader to make use of it in a minimum period of time.

The 3 opening chapters deal with Infection and Infectious Agents, Host-Parasite Relationship, and Anatomical and Physiological Factors in Infection and Resistance of the Individual. In this section—as in others—definitions are freely given and every effort made to present the facts in a simple manner.

With this background, the chapters which follow treat of inflammation and tissue immunity, humoral and cellular defenses, hypersensitiveness, the mechanisms underlying antigen-antibody reactions, and procedures. There are 4 chapters on antigens—their structure and specificity. A short chapter on colloids gives fundamental information and comes just before the discussion of the mechanism of antigen-antibody reactions, a discussion which must assume some knowledge of colloids and their behavior.

Four chapters on Hypersensitiveness conclude the book and are given this place because it is felt that the "present theories pertaining to the complex problems inherent in allergy" are better understood if preceded by discussions of antigen-antibody reactions in general.

The literature has been thoroughly reviewed, the material sorted and reduced, and only the essential conclusions presented. However, complete references are given at the end of practically all chapters and the original papers may be consulted for more detailed information.

It is altogether a book to be recommended to the medical student or to any other person interested in the subject of immunity. The student will find confusing situations cleared up and it should stimulate him to further knowledge.

The book is printed on good paper and is of convenient size.

ANNA DEAN DULANEY

A Textbook of General Bacteriology—*By Edwin O. Jordan, Ph.D. (11th ed.) Philadelphia: Saunders,* 1935. 825 pp. Price, $6.00.

A book that has reached its 11th edition has given proof of its value, and there remains little to be said about it, either in the way of criticism or of praise.

This latest edition has been entirely reset. A number of the chapters, like those on Immunity, Streptococci, Salmonella, Brucella, Rickettsia and on Spirochetes, have been modified and added to, while the section on The Viruses and Virus Diseases has been practically rewritten.

The author feels that the problem of nomenclature is largely unsettled, and hesitates in his book to use names

that have not won fairly general acceptance. Apart from this it may be said that the book maintains the high standard of previous editions. It is beautifully printed and abundantly illustrated, and will doubtless hold the place it has had for so long as one of our leading American textbooks.

MAZYCK P. RAVENEL

Reports of the National Quarantine Service. Series V, 1934—*Edited by Wu Lien-Teh and C. Y. Wu. Shanghai: National Quarantine Service,* 1935. 233 pp. Price, $2.00.

The fifth series, or 1934 Reports, of the National Quarantine Service of China is edited by the Director, Wu Lien-teh, and C. Y. Wu, the Senior Quarantine Officer. The reports contain 8 original articles relating principally to plague, cholera, and leprosy, and an address by the Director entitled, "The Private Medical Practitioner in Relation to Public Health"—which are all of general interest. The rest of the book contains Divisional Reports, Branch Station Reports, and a list of personnel, which are of local interest, together with the Special Reports on the new quarantine station at Woosung, the Central Cholera Bureau, and analyses of special investigations of human cases of bubonic plague.

In the first of the original articles Dr. Wu Lien-teh briefly summarizes significant epidemiological features of various plague epidemics which have occurred in North and South China. He observes that pneumonic plague is conspicuous in the North. Bubonic plague in China is thought to be transmitted almost exclusively by the *X. cheopis*. In the South, plague is considered on the wane, but some apprehension is expressed that the development of rapid transportation may enhance the dissemination of plague in North China.

Dr. C. Y. Wu relates the existing data on the prevalence of rat fleas in China. Rather continuous surveys are being conducted in 7 ports and the results lend support to the Madras observations of King and Pandit regarding climatic variations of flea incidence. Charts are presented to demonstrate the seasonal distribution of rat fleas correlated with the occurrence of human plague in China.

Dr. J. W. H. Chun presents an analysis of the cholera problem in China. A review of the more important epidemiological studies made in connection with past cholera epidemics indicates that cholera is endemic in China and that recent epidemics are most likely of domestic origin.

Dr. R. Pollitzer, Microbiologist of the National Quarantine Service of Shanghai, reports observations on the behavior of cholera and cholera-like vibrios in blood and milk media. The cholera-like vibrios were taken from routine samples of drinking water collected in Shanghai and the studies are directed toward revealing their true relationship. The results are chiefly of technical interest in a highly important but as yet an unsolved and perplexing epidemiological problem.

Dr. J. W. H. Chun records an analysis of 37 heat stroke cases which were admitted to the Chinese infectious disease hospital at Shanghai during the June and July, 1934, heat wave when the wet bulb temperature remained above 80° F. for 26 consecutive days. The analysis treats different aspects such as age, sex, symptoms, mortality, methods of treatment, duration of hospitalization, etc.

Dr. F. S. Wong and Dr. C. Y. Wu ably discuss the medical inspection of vessels, including emigrant ships, in China. This is of particular interest to health officers.

Dr. Lee S. Huizenga presents a brief but interesting history of leprosy in China. China has some of the oldest

records of mankind and it is indicated that peaks in leprosy incidence occurred B.C. 5000, 1000, 500 and A.D. 250, 600, 1600 and 1930.

The reports reveal the remarkable growth of the National Quarantine Service, which was organized in 1930, and it appears that the apparently insurmountable economic and other difficulties are being overcome with amazing rapidity. F. A. CARMELIA

Free Medical Care, Socialized Medicine—*Compiled and edited by E. C. Buehler. New York: Noble and Noble,* 1935. 360 pp. Price, $2.00.

This book, compiled by the Directors of Forensics at the University of Kansas, is useful. Apparently the selections are made impartially. On the one hand we have articles by Fishbein, Editor of the *J.A.M.A.*, who we believe represents fairly the attitude of the medical profession in general in opposing socialized medicine. On the other hand, there are articles by Ray Lyman Wilbur, Chairman of the Committee on the Costs of Medical Care, as well as by some of those who were engaged in getting out that report. It will be remembered that the committee split three ways in making their report.

There is an interesting chapter which gives outlines of 25 different forms of socialized medicine already adopted in various parts of the United States and Canada. There is a fairly full collection of the reports and resolutions regarding socialized medicine by the American Medical Association, the American College of Surgeons, the American Dental Association, and both the Majority and Minority Reports by the Committee on the Costs of Medical Care.

The controversies in the ranks of the medical profession over this question seem to be meat for those engaged in forensics in the universities. We need only to recall the debates which are going on throughout this country on the subject. We cannot blink the fact that the subject is engaging the attention of many people in this as well as other countries. As a source book this collection can be recommended. It is well printed and put together.

MAZÝCK P. RAVENEL

The Single Woman and Her Emotional Problems—*By Laura Hutton. Baltimore: Wood,* 1935. 151 pp. Price, $2.00.

This little volume, by a physician at the Institute of Medical Psychology, in London, packs into 147 pages more of intelligent understanding and sympathetic insight into the problems confronting the single woman of today, in England and America at least, than this reviewer has ever seen anywhere. It makes no pretense to discussion of the complicated factors, physical, mental, and social, that lie back of the predicament in which thousands of women in our contemporary civilization find themselves, though enough is given to set the problems in proper perspective and to indicate the author's rich background of knowledge and experience. But it goes straight to the point, and deals with the emotional and psychological problems which develop out of the type of adjustment to life which the single woman, willy-nilly, is forced to make.

The basic problem, says Dr. Hutton, is *loneliness,* of the soul-destroying kind brought about by the frustration of a woman's deepest instincts, and which no amount of congenial work or business and professional associations can assuage. It is *personal* relationships that a woman wants, human beings with whom she can share emotional satisfactions, and it is this need that lies back of the irrational behavior so often exhibited by the single woman in her relations with other people. In a

most illuminating chapter, Dr. Hutton discusses her emotional friendships and the problems to which they give rise. Two following chapters discuss the sexual problems of women and sexual inversion or homosexuality candidly and clearly, in a manner that could give offense to no one, and will certainly be of great help and encouragement to women who are struggling with the situations here considered. A final brief chapter on "Adjustments" pulls the entire discussion together and gives some further constructive suggestions regarding the handling of her problems by the woman herself.

We commend the thoughtful perusal of this book to all intelligent people, whether they are in direct contact with the problems it discusses or not. WINIFRED RICHMOND

Lewis' New Air Conditioning for Comfort—*By Samuel R. Lewis. (2nd ed.) Chicago: Keeney Publishing Co.*, 1935. 277 pp. Price, $2.50.

This is a practical book which should prove very useful to engineers concerned with the design and installation of air conditioning systems, and which, if supplemented by handbooks, periodical literature and catalogs, would provide them with the material needed. It is not a textbook which goes deeply into the underlying theory. Clarity and order are its keynote and tempo. The mathematics required for its use do not go beyond arithmetic and simple algebraic equations.

Diagrams, tables, charts, and numerical working examples are abundant. The use of the psychometric table as being more efficacious than the chart is stressed. Consideration of cooling, humidifying, etc., in relation to heating is maintained while clarifications in their relationships are suggested.

Its contents include air conditioning systems, humidifying and dehumidifying, refrigeration for air conditioning, heat transmission and incidental sources of heat, air supply and distribution, water circulation in heating and cooling systems, examples of heating and cooling commercial buildings and houses, and operating costs.

The volume would have the same kind of function in a public health engineer's library as would a good handbook on plumbing. It is too brief to be an exhaustive treatise but it is a fine outline which condenses a great deal of information not otherwise available in assembled form. CHARLES L. POOL

The Human Foot—*By Dudley J. Morton. New York: Columbia University Press*, 1935. 244 pp. Price, $3.00.

The author has taken a long step forward toward placing the study and treatment of foot imbalance on its proper plane of importance and dignity. This book is a distinct contribution to medical literature. The purpose of the book as clearly stated in its preface is a study to identify and analyze the primary factors of functional disorders of the foot. The study has been carried out in three parts: The Evolution and Development of the Human Foot, The Physiology of the Human Foot, The Functional Disorders of the Human Foot.

Under the heading of evolution and development Morton discusses in a most exhaustive and convincing manner the evolution of the human foot from its earliest beginning in the fish up through the amphibian, reptilian, mammalian and early primate periods to the completely developed human foot as it is today. The material contained in this section of the book indicates that an exhaustive research and investigation has been carried out and the subject matter constitutes the most authoritative presentation of evolutionary data on the foot with which we are acquainted.

Under physiology, the function of the foot, both static and in locomotion, is discussed and the extremely interesting conclusions reached are supported by carefully established facts. The conclusions drawn regarding the part played by the muscles of the leg and foot as supports to the arches of the foot are especially interesting and important since they differ widely from many accepted opinions of today. This section contains a very careful study of the mechanism of the foot in standing, walking, and running.

Functional disorders of the foot are considered from two points of view: structural defects and environmental factors, such as general conditions under which the individual lives, and foot-wear. Three fundamental structural defects are listed as primary causative factors: (1) Short first metatarsal bones; (2) Posteriorly located sesamoid bones; (3) Hypermobility of the first metatarsal segment. Morton explains most of the imbalance which occurs in the foot on the basis of these structural defects although later he adds a fourth—shortened calf muscles. The chapter on treatment is most suggestive since the methods advocated for correcting or counteracting the effects of structural faults in the foot are based on the basic pathology present as determined by the author's investigation. Foot-wear is adequately discussed and the influence of environmental factors thoughtfully dealt with.

It is impossible in a short review to attempt to indicate the completeness and thoroughness of the study which has been carried out and the importance of the observations made. It may be said, however, that Morton's work has raised the diagnosis and treatment of foot conditions from a plane which has been largely empiric to one with a real physiological basis. Not all orthopedic surgeons may be willing to accept in their entirety the conclusions Morton has arrived at but all can profit from a study of this work. In addition to its technical excellence, the subject matter is clear and well co-ordinated and makes delightful reading. Typographically the publishers have produced an excellent book with copious illustrations.

FRANK D. DICKSON

Pioneering with the Red Cross—*By Ernest P. Bicknell, Vice-Chairman in Charge of Insular and Foreign Operations, The American Red Cross. New York: Macmillan,* 1935. 281 pp. Price, $2.00.

This is a travel and adventure book in connection with great emergencies which occurred in nearly all parts of the world from the time of the San Francisco Earthquake, 1906, to the getting of American refugees out of Europe with the beginning of the World War in 1914, with many personal anecdotes—amusing, dramatic, and some truly awful. It is a narrative in which the author, who started as a newspaperman, became an early organizer of State Charities in Indiana (1893–1898), then Superintendent of the Bureau of Charities of Chicago (1898–1908), and finally National Director of the American Red Cross. It is a story of intimate personal contacts with presidents, cabinet members, kings, queens, princes and princesses, generals and admirals, great business executives, politicians, noted charity, civic, and religious workers, revolutionary leaders, and outlaws.

A master organizer, in simple and straightforward language, interwoven with many facts and figures, relates great cataclysms, general and personal dangers, the meeting of embarrassing situations, graft, audacious opponents, and oftentimes a misinformed public. He recites in detail how these were faithfully and fearlessly met and overcome or assuaged as befitted the occa-

sion. Operations were carried on, oftentimes almost without funds. Mobs were subdued and their energies shaped to useful ends. Well meaning but foolish or ignorant donors and would-be helpers often proved as great problems as the emergencies.

What could be more embarrassing than to have the millers of Minneapolis send enough flour to San Francisco in 1906 literally to block the avenues of transit and to suffice the inhabitants for 10 years! Or, the case of the Yakima farmer who placed a note in a sack of potatoes (of which that fertile Washington valley sent trainloads to Ohio flood sufferers in 1913), and who received, later, a letter from an irate Cincinnatian who had paid full price for the potatoes on the open market, and to have a great Oregon newspaper get hold of the incident—with all the explanation which had to follow—and yet everything was strictly "according to Hoyle," when the facts became known.

No moving picture ever spun its tale more interestingly, or with better themes or more rapid changes of scene. The mine disaster, the forest fire, the volcano which burst without warning in far away Luzon, border warfare and intimate glimpses of the Madero-Villa revolution, ship disasters, etc., and the parts played by women and nurses, doctors and hospitals, philanthropists and governments, railroads and battleships, and so on without end.

The reader gains a coherent idea of the evolution of the American Red Cross during its formative years and, in the aftermaths of catastrophes, the triumph of case work over stultified relief. The development of the Christmas Seals as a means of funding local and national Red Cross, and especially tuberculosis work, forms an interesting interlude.

We have in this volume the memories of a man who was constantly being "found out" and called to greater responsibilities. A study of the bases upon which he made his decisions is worth any one's time. A suitable index accompanies. EMERY R. HAYHURST

Mother and Baby Care in Pictures—*By Louise Zabriskie, R.N. Philadelphia: Lippincott,* 1935. 196 pp. Price, $1.50.

This highly pictorial book is a new adventure in placing before expectant parents the essentials of prenatal care, preparations for confinement, delivery service, and care of the new-born. It covers a wide range of subject matter from the time of conception through each stage of development into infancy and early childhood.

Each section is profusely and beautifully illustrated. The photographic reproductions could scarcely be improved. The captions and descriptions are so clear that any mother can carry out the details.

There is only one possible objection which might be raised by certain of the medical and nursing profession. That is the series of pictures in Chapter VI, which show in detail the various steps in the delivery. What the reaction of the younger generation, who demand a knowledge of all facts, may be can only be surmised. Their parents and the "old family doctor" certainly would expurgate pages 68–71. But this experimental venture should not prejudice us against the whole book, which is exceedingly well prepared by one who has had a wealth of experience in the whole field of obstetric nursing. RICHARD A. BOLT

Public Health Administration in the United States—*By Wilson G. Smillie. New York: Macmillan,* 1936. 458 pp. Price, $3.50.

"This book is dedicated to the Pioneers of the Modern Public Health Movement in the United States, who in

1872 founded the American Public Health Association and at that first meeting laid the foundation stones on which Public Health Administration in the United States has been built."

Dr. Smillie, an experienced and independent research student in administrative health procedures and their results, and a teacher of distinction at the Harvard School of Public Health, has made convenient for health officers and all others concerned with the practice of this specialty of the medical sciences, a long awaited handbook of current health procedures.

He offers factual description rather than critical analysis of the conduct of health departments in this country, with supplementary comment upon the non-official health agencies. He stops short of dealing with international health relations, which some readers will regret.

He is particularly courageous, definite, and satisfying in dealing with the desirability of locating school health supervision under a department of health rather than a department of education.

The book will be useful to many physicians and nurses not members of official or nonofficial health agencies, as well as to teachers, editors, and publicists of a wide variety. References, quotations are well chosen, the contents and index adequate and convenient, the form and matter appropriate for the purpose of the volume.

Dr. Smillie is to be complimented upon his priority in this field in the United States, as well as on the excellence of this first edition.

HAVEN EMERSON

BOOKS RECEIVED

LENGTH OF LIFE: A Study of the Life Table. By Louis I. Dublin and Alfred J. Lotka. New York: Ronald Press, 1936. 400 pp. Price, $5.00.

SOCIAL SECURITY. By Edward H. Ochsner. Chicago: Social Security Press, 1936. 231 pp. Price, $.50.

THE GROWTH AND DISTRIBUTION OF POPULATION. By S. Vere Pearson. New York: Wiley, 1935. 448 pp. Price, $4.00.

CRIME, CHARACTER AND EDUCATION. By Sidney J. Beer, Inglewood, Calif. Author, 1935. 190 pp. Price, $1.00.

LOBAR PNEUMONIA AND SERUM THERAPY. By Frederick T. Lord and Roderick Heffron. New York: Commonwealth Fund, 1936. 91 pp. Price, $1.00.

VITAMINS. IN THEORY AND PRACTICE. By Leslie J. Harris. New York: Macmillan, 1935. 240 pp. Price, $3.00.

YOU MUST EAT MEAT. By Max Ernest Jutte. New York: Putnam, 1936. 164 pp. Price, $2.00.

THE DIAGNOSIS AND TREATMENT OF PULMONARY TUBERCULOSIS. By John B. Hawes and Moses J. Stone. Philadelphia: Lea & Febiger, 1936. 215 pp. Price, $2.75.

PRINCIPLES OF HYGIENE. Revised edition. By Thomas A. Storey. Stanford University Press, 1935. 524 pp. Price, $3.50.

YOUR CHILD IN HEALTH AND IN SICKNESS. By Hugh L. Dwyer. New York: Knopf, 1936. 333 pp. Price, $2.75.

DISEASE AND DESTINY. By Ralph H. Major. New York: Appleton-Century, 1936. 338 pp. Price, $3.50.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

Midwifery and the Frontier Nursing Service—Among other interesting facts, a survey of the second series of supervised births reveals no maternal deaths from any causes, in spite of the fact that 193 mothers had puerperal complications during pregnancy, 277 during labor, and 83 during the postpartum period.

ANON. Tenth Annual Report. Quart. Bull., Frontier Nursing Service, 11, 1:13 (Summer), 1935.

More Pro BCG—Health records of Canadian infants vaccinated with BCG are so much more favorable than those of an unvaccinated group that the author is forced to conclude that vaccination must be included as a part of a complete anti-tuberculosis program.

BAUDOUIN, J. A. Vaccination Against Tuberculosis With BCG Vaccine. Canad. Pub. Health J. 27, 1:20 (Jan.), 1936.

Rural Midwifery — Picturing the practice by midwives in a rural Virginia county, this survey is typical of country conditions no doubt. Twelve years of midwife instruction appears to have produced precious little in the way of results.

DANIEL, J. L., and GAFAFER, W. M. The Rural Midwife: Her Social and Economic Background and Her Practices as Observed in Brunswick County, Virginia. Pub. Health Rep. 50, 52:1807 (Dec. 27), 1935.

For Better Public Health—Brief references to historic plagues emphasize the author's point that progress in public hygiene follows advances in medical research when properly trained administrators undertake socially justifiable projects. A fine paper.

DRINKER, C. K. Problems and Progress in Public Health. Pub. Health Nurs. 28, 1:10 (Jan.), 1936.

When Two Can Give Artificial Respiration—For artificial respiration, an arm lift movement carried on by a second operator is suggested as a supplementary mechanism to the prone pressure method. The French navy has already adopted this scheme.

DRINKER, C. K., and SHAW, L. A. A Modification of the Neilson Method of Artificial Respiration. J. Indust. Hyg. 17, 6:243 (Nov.), 1935.

Hearing Life Tick—As physiology, which underlies all of hygiene, is a subject in which most of us are woefully weak, this description of recent studies in the mechanism of protoplasm will prove worth careful reading. Incidentally, it is an excellent example of the possibility of putting into plain English a subject as obtruse as biophysics or physical chemistry.

GRAY, G. W. Machines which Imitate Life. Harper's Magazine, 172, 2:341 (Feb.), 1936.

Mental Health of Mothers—All who care for postpartum patients should be aware of the significance of mental health, the symptoms of deviation, and the help which is needed. This is discussed in detail, points being well illustrated by case stories from a visiting nurse association.

HASTINGS, G. L. Mental Hygiene of the Postpartum Period. Trained Nurse & Hosp. Rev. 95, 6:549 (Dec.), 1935.

Pro State Medicine—An account by a physician of an organiation for medical relief set up in a mid-western county that has reduced cost and improved service to the satisfaction of the patients and physicians.

KNISKERN, P. W. Our Town, M.D. Survey Graphic, 25, 1:34 (Jan.), 1936.

Less Syphilis, More Gonorrhea—Fewer pregnant women with syphilis, reduction in clinic admissions and cases reported, and a similar drop in neurosyphilis lead to the conclusion that the disease really is less prevalent in Massachusetts. Marked increases in reported gonorrhea have occurred during the same 5 year interval.

NELSON, N. A. The Decreasing Prevalence of Syphilis in Massachusetts. J.A.M.A. 106, 2:105 (Jan. 11), 1936.

Children of the New-Poor—This distressing paper concludes that those who have been viewing with alarm the increased fertility brought on by dependency have probably been exercising themselves over something that did not happen. Things have come to a pretty pass when a heartless researcher dares to pull the props out from under one of our best birth control platforms!

NOTESTEIN, F. W. The Fertility of Populations Supported by Public Relief. Milbank Memorial Quart. 14, 1:37 (Jan.), 1936.

Effective Syphilis Control at Last—After 20 years of struggle, one health department has been granted increased funds to attempt a real state-wide syphilis control program to provide adequate facilities for diagnosis and treatment, improved case supervision, complete epidemiologic investigation, and professional and public education.

PARRAN, T. Syphilis Control in New York State. Milbank Memorial Quart. 14, 1:57 (Jan.), 1936.

Preparing the Nurse for Parent Education—A discussion of what the nurse needs to know about normal children—their growth and development, and about family and community life, if she is to be prepared for parent education. The use of the nursery school by schools of nursing, and the carrying over of nursery school methods into hospital practice is suggested.

RAND, W. What Constitutes a Preparation for the Nurse in Parent Education. Am. J. Nurs. 35, 12:1176 (Dec.), 1935.

In Praise of Meat—This Arctic explorer tells us that others who have had to live on fresh seal, fish or penguin meat did not suffer from scurvy even when deprived of supposed essential antiscorbutics. Total absence of caries from those who live wholly on meat is definite. Cessation of decay occurs when transferred from a mixed to meat diet. Many other virtues are ascribed to meat.

STEFANSSON, V. Adventures in Diet. Harper's Magazine, 172, 1:178 (Jan.), 1936.

How to Control Venereal Diseases—All essential procedures for a state or local venereal disease control program are set forth briefly in the statement of the recommendations of an eminent committee. Adequate diagnostic and treatment facilities, epidemiologic and educational projects are, of course, included. The plan was pretty generally accepted in principle more than a dozen years ago, but it bears repeating since it appears about to be tried somewhat belatedly at least in one state.

VONDERLEHR, R. A., *et al.* Recommendations for a Venereal Disease Control Program. J.A.M.A. 106, 2:115 (Jan. 11), 1936.

Health and Depression—As would be expected, the food of families upon relief and in the lowest income groups in 1933 was deficient chiefly in milk and vegetables. The caloric values were also inadequate.

WIEHL, D. G. Diets of Low Income Families Surveyed in 1933. Pub. Health Rep. 51, 4:77 (Jan. 24), 1936.

Rural Typhoid Prevention—Thirteen years of a rural typhoid fever vaccination program combined with projects for the improvement of rural sanitation produced a marked improvement in the typhoid case rate with no deaths during the last 5 years. Surrounding areas without adequate health administration enjoyed no such decreases.

WILLIAMS, W. C., and BISHOP, E. L. The Typhoid Control Program and Results in Thirteen Years' Work in Williamson County, Tennessee, 1922–35. Pub. Health Rep. 51, 1:1 (Jan. 3), 1936.

Heated Dust vs. Appetite—That odors have an effect upon human health and comfort is the inescapable conclusion to be drawn from the evidence offered.

WINSLOW, C.-E. A., and HERRINGTON, L. P. The Influence of Odor Upon Appetite. Am. J. Hyg. 23, 1:143 (Jan.), 1936.

ASSOCIATION NEWS

APPLICANTS FOR MEMBERSHIP

The following individuals have applied for membership in the Association. They have requested affiliation with the sections indicated.

Health Officers Section

Robert E. Archibald, M.D., 23 Red Rock St., Lynn, Mass., State District Health Officer

Edgar B. Beaver, M.D., County Health Dept., Gallup, N. Mex., Health Officer, District No. 2

Max Bernstein, M.D., 345 E. 116 St., New York, N. Y., District Health Officer

Arthur I. Blau, M.D., 108 W. 136 St., New York, N. Y., District Health Officer

H. Warren Buckler, M.D., 806 Cathedral St., Baltimore, Md., Director, Division of School Hygiene and District Health Officer

F. Edward Burke, M.D., Wakefield, R. I., Health Officer

Dr. R. Frank Cary, Dawson, Ga., Terrell County Commissioner of Health

Donald G. Evans, M.D., C.P.H., 422 Malden Ave., Seattle, Wash., Director of Child Hygiene, City Health Dept.

William H. Hill, M.D., D.P.H., Calgary, Alta., Canada, Medical Officer of Health

John L. Jones, M.D., Court House, Medina, Ohio, Medina County Health Commissioner

Clarence T. Roome, M.D., 2741 Cuesta Rd., Santa Barbara, Calif., City Health Officer

Richard L. Russell, M.D., P. O. Box 148, Springfield, Mo., Greene County Health Officer

Gilbert E. Seaman, M.D., Winnebago, Wis., Superintendent, Winnebago State Hospital

James P. Sharon, M.D., 610 State Bank Bldg., Fort Dodge, Ia., Director, Venereal Disease Control, Webster County

George H. Zerbst, M.D., Manning, S. C., County Health Officer

Laboratory Section

Howard A. Ball, M.D., San Diego County Hospital, San Diego, Calif., Director of Laboratory

Kathryn Barron, B.S., Braden Castle, Manatee, Fla.

Kenneth P. Cash, B.S., City Hall, Lawton, Okla., Health Officer and Chemist

Rolland D. Fox, B.S., 703 Municipal Bldg., Akron, O., Director of Health Dept. Laboratories

Hazel B. Gillespie, B.S., 310 Cedar St., New Haven, Conn., Brady Laboratory

David W. Horn, Ph.D., P. O. Box 666, Bryn Mawr, Pa., Chemist to local suburban boards

C. William Janson, M.A., Cross Highway, Westport, Conn., Director, Diagnostic Bacteriological Laboratory

Einar Leifson, Ph.D., Department of Pathology, Johns Hopkins Medical School, Baltimore, Md., Instructor in Bacteriology

Marian G. Sprick, B.S., 442 Sinclair Ave., N.E., Grand Rapids, Mich., Bacteriologist, Pertussis Immunization Project, Michigan Dept. of Health

Vital Statistics Section

Martin B. Woodward, M.D., State Board of Health, Columbia, S. C., Director of Bureau of Vital Statistics

Public Health Engineering Section

William G. Christy, M.E., Court House, Jersey City, N. J., Smoke Abatement Engineer, Hudson County

Lloyd K. Clark, B.S., State Health Dept., Bismarck, N. D., Sanitary Program, U. S. Public Health Service

H. A. Nordquist, Hobart Mfg. Co., Troy, Ohio, Development of Effective Methods of Cleansing Tableware

Industrial Hygiene Section

James M. Carlisle, M.D., Merck & Co., Inc., Rahway, N. J., Industrial Medicine and Hygiene

Samuel Kahn, M.D., 30 Beekman Place, New York, N. Y., Medical Examiner, New York State Labor Dept.

Charles S. Slocombe, Ph.D., 29 West 39 St., New York, N. Y., Personnel Research Federation

Paul F. Stricker, U. S. Dept. of Labor, Washington, D. C., Safety Engineer, Division of Labor Standards

Food and Nutrition Section

R. Hugh MacDonnell, B.S., 420 Lexington Ave., New York, N. Y., Head of Central Laboratory, Quaker Maid Company

Ira A. Manville, M.D., Ph.D., 7208–34 Ave. S.W., Multnomah, Ore.

William H. Stoner, M.D., Burroughs Wellcome & Co., Tuckahoe, N. Y., Research Consultant

Public Health Education Section

Dorothea Campbell, State Health Dept., Charleston, W. Va., Director, Bureau of Public Health Education

Albert E. Fossier, M.D., 1208 Maison Blanche Bldg., New Orleans, La., Bureau of Medical Education, City Board of Health

Bertha S. Mason, M.D., 82 S. 17 St., San Jose, Calif., College and School Health Work

James G. Stone, 122 E. 7 St., Los Angeles, Calif., Executive Secretary, Los Angeles Tuberculosis and Health Assn.

Elbert W. Wright, M.D., Bowie Clinic, Bowie, Tex., Chairman, State Board of Health

Public Health Nursing Section

Mary Bedford, R.N., Gibson County Health Dept., Trenton, Tenn., Supervising Nurse

Ellen Coffey, R.N., 2849a Accomac St., St. Louis, Mo., Staff Nurse, Municipal Visiting Nurses

Loretta W. Converse, R.N., 63 Dutton Ave., San Leandro, Calif., School Nurse

Laura A. Murphy, R.N., 539 E. 9 St., Erie, Pa., Supervisor of Tuberculosis, Erie Visiting Nurse Assn.

Marian G. Randall, 40 Wall St., New York, N. Y., Technical Staff Member, Division of Research, Milbank Memorial Fund

Mariana H. Ward, R.N., 17 E. 37, Savannah, Ga., Visiting Nursing Supervisor, Savannah Health Center

Epidemiology Section

Martin R. Beyer, M.D., 2006 N.W. 39 St., Oklahoma City, Okla., State Epidemiologist

William R. Carroll, Ph.D., Bacteriology Department, University of Florida, Gainesville, Fla., Professor of Bacteriology and Immunology

Leonard A. Dewey, M.D., C.P.H., Portales, N. Mex., District Health Officer

Lynne A. Fullerton, M.D., 404 Federal Bldg., Spokane, Wash., District Medical Officer, Indian Service

Gerald E. McDaniel, M.D., C.P.H., State Board of Health, Columbia, S. C., Epidemiologist

James D. Trask, M.D., New Haven Hospital, New Haven, Conn., Associate Professor of Pediatrics, Yale University School of Medicine

Unaffiliated

Wendy Stewart, M.D., 445 S. Kingsley Drive, Los Angeles, Calif., Teaching Course in Public Health Law, University of Southern California, School of Government

Barta Wold, R.N., 143 W. 4 St., Williamsport, Pa., Executive Secretary, Lycoming County Tuberculosis Society.

NEWS FROM THE FIELD

FLOATING OF OYSTERS

THE recent action of the New Jersey Health and Sanitary Association Council on a matter of large public importance to New Jersey, draws attention to a very important subject in connection with the public health. The New Jersey association called a spade a spade.

A serious situation of the shellfish industry of New Jersey has grown out of a recent ruling by the U. S. Public Health Service barring from interstate traffic all shellfish originating in New Jersey. This ruling was occasioned by the action on January 14 of the New Jersey State Board of Health, permitting the "floating" of oysters in the Maurice River in South Jersey. This action of the Board of Health rescinded an order against the "floating" of oysters in this river about 2 years ago, based on the accepted fact that the river was polluted and that such a practice was a danger to health.

In announcing the action of the Public Health Service, it has been stated that "The reopening of the Maurice River area has caused the Public Health Service to feel that it cannot consistently continue to give its endorsement to sanitary control of the shellfish industry maintained by the state authorities in New Jersey." This brings the shellfish producers of New Jersey face to face with a critical situation, particularly since the ruling almost automatically prevents domestic as well as interstate sales.

According to the findings of the New Jersey Health and Sanitary Association, the present difficulty arises because of policies which in recent years have governed appointments to the State Board of Health. These appointments have recently been made in some cases from representatives of industrial, commercial, and agricultural interests, who may not be entirely free to ignore the effects that rulings and regulations of the State Department of Health may have on their particular enterprises.

Without questioning the integrity and intelligence of those who are members of the State Board of Health, the local association expresses its conviction that no person should serve as a member if the individual interests of that person may come into conflict with his official responsibility and his duty toward safeguarding the public health. It is their opinion that the shellfish representative now on the Board was placed there to protect the industry rather than to protect the public.

This action in New Jersey appears to be an example of what state associations may accomplish when they take their responsibilities seriously. It is a matter of record that other representatives of commercial interests have been appointed to places of responsibility in various communities, presumably with the purpose of preventing certain actions which may be in the interests of the public health. Fortunately in this instance the Public Health Service is in a strategic position and can properly hold the whip hand. It would be safe to surmise that the shellfish representative on the New Jersey State Board of Health now sees his position in a new light.

NOTE: It is gratifying to learn that on February 11 the New Jersey State Board of Health rescinded its resolution permitting storage of shellfish in the Maurice River and that the federal ban was raised on February 14 for other shellfish from New Jersey.

NEW YORK STATE SEWAGE WORKS ASSOCIATION MEETING

THE Eighth Annual Meeting of the New York State Sewage Works Association was held in New York City, January 14 to 17, with headquarters at the Hotel Astor.

Linn H. Enslow, of New York, F.A.P.H.A., was elected President, and Charles C. Agar, of Albany, Vice-President. Arthur S. Bedell, of the New York State Department of Health, Albany, member A.P.H.A., was reappointed Secretary-Treasurer.

One feature of the program was the presentation, by President Morris M. Cohn, of Schenectady, member A.P.H.A., of the Kenneth Allen Memorial Awards for 1935 to Samuel I. Zack for the most meritorious paper of a technical and research nature, and to Harry H. Hendon, of Birmingham, Ala., member A.P.H.A., for the best paper on sewage plant operation presented during the year. Mr. Hendon presented a paper on "Chemical Treatment during 1935 at Birmingham, Ala.," at the afternoon session, supplementing his paper presented at the previous annual meeting. Mr. Zack presented a paper on "Operating Experiences at Perth Amboy, N. J." and the discussion on these two papers was opened by F. W. Gilcreas, of Albany, member A.P.H.A., and Linn H. Enslow.

The spring meeting of the Association will be held at Lido Beach, L. I., early in June.

DR. HUGH S. CUMMING RETIRES AS SURGEON-GENERAL

HUGH S. CUMMING, M.D., Sc.D., LL.D., retired on February 1 from the post of Surgeon-General of the U. S. Public Health Service, in which he has served since 1894. Dr. Cumming's appointment as Surgeon-General dates from 1920; he was nearing the completion of his fourth consecutive term in that capacity.

Dr. Cumming has been a member of the American Public Health Association since 1914 and was made a charter Fellow in 1922. He served the Association as President in 1931.

Among the outstanding advances made by the U. S. Public Health Service during his administration may be listed the completion of the national quarantine system, the inauguration of pre-immigration examinations at American consulates, the establishment of a national leprosarium and a national narcotic farm, and the construction of 8 marine hospitals. The National Institute of Health was also created from the former Hygienic Laboratory during his term.

Dr. Cumming has also been deeply interested in the promotion of international health work and as Vice-President of the Health Section of the League of Nations, as American member of the Office International d'Hygiene Publique, as United States representative of the Pan-American Sanitary Convention, as director of the Pan-American Sanitary Bureau, and as President of the Allied Medical Mission to Poland, he has rendered distinguished service.

YELLOW FEVER VOLUNTEER DIES

THE daily press of February 10 carried news of the death of Levi E. Folk, who was one of those who submitted himself to the bites of mosquitoes in the well known experiments of Walter Reed, in Cuba. He was 66 years old on February 7.

In 1933, when our Association met in Indianapolis and commemorated there the announcement made by Dr. Reed of his discoveries in 1900, Mr. Folk was one of the 4 survivors who attended. He must be remembered as one of the heroic men who risked his life in the demonstration of this great discovery.

A paper found among his effects told the story of his part in the fight.

"When yellow fever appeared amongst the troops at Columbia Barracks, Cuba," the paper said, "the surgeon (Dr. Reed) asked for volunteers to nurse it. I, with several others, volunteered and was at the yellow fever hospital until I left to go to Camp Lazear in the fall of 1900.

"From November 30 to December 19, 1900, I slept in a specially built house (built to keep out the mosquitoes), in which was placed a large quantity of bedding taken from the beds of patients sick with yellow fever in Havana. I did not suffer any ill effects from this experiment. On January 18, 1901, I submitted to mosquito inoculation and contracted yellow fever on January 23, 1901. After my recovery, I was bitten several times by infected mosquitoes to test my immunity. I did not become infected by any of the bites after that one on January 18, 1901."

NURSES CONVENTION

THE Biennial Convention of the American Nurses' Association, the National League of Nursing Education, and the National Organization for Public Health Nursing will be held in Los Angeles, Calif., June 21–26, 1936. The headquarters hotels for the three nursing groups will be as follows: Ambassador—American Nurses' Association, National League of Nursing Education; Biltmore—National Organization for Public Health Nursing.

ROYAL SANITARY INSTITUTE

ON behalf of the American Public Health Association the following cablegram was dispatched to the Royal Sanitary Institute, London, on the announcement of the death of King George.

The American Public Health Association extends to the Royal Sanitary Institute sincere condolences on the passing of His Majesty King George V.

The following reply has been received by radio from the Royal Sanitary Institute:

The Council of the Royal Sanitary Institute in special meeting assembled received the message of condolence from the American Public Health Association on the death of His Majesty King George, Patron of the Institute. They tender to the American Public Health Association sincere thanks for their sympathy in the sorrow the Institute shares with the Nation.

The large number of members of the American Public Health Association who are subjects of the British Crown have suffered a special loss which is shared by the entire world.

DAIRY, FOOD, DRUG OFFICIALS TO MEET IN FLORIDA

THE 1936 meeting of the Association of Dairy, Food and Drug Officials of the United States will be held at the Miami Biltmore Hotel, Coral Gables, Florida, November 9–12.

HEALTH WORKERS OF TENNESSEE

THE eighth annual conference of health workers of Tennessee was held January 30 to February 1, with a registration of approximately 250.

A. W. Freeman, M.D., Dean, School of Hygiene and Public Health, Johns Hopkins University, delivered a paper on "Accepted Policies in the Administration of a County Health Department." Another interesting paper was the one on records and reports by W. F. Walker, Dr.P.H., Director, Division of Health Studies, the Commonwealth Fund.

One morning was devoted to different phases of public health education.

J. P. Leake, M.D., Surgeon, U. S. Public Health Service, gave two talks on epidemiology, his subjects being "Our Current Knowledge of Poliomyelitis," and "Futile Gestures versus Sound Procedures in Communicable Disease Control."

Other guest speakers were Pearl McIver, R.N., Martha Eliot, M.D., Clarence L. Scamman, M.D., and W. K. Sharp, Jr., M.D.

The conference also included an inspection of the new quarters of the State Health Department.

ORTHOPEDIC SURGEONS' EXHIBITS

AT the annual meeting of the American Academy of Orthopedic Surgeons, scientific exhibits were presented by 35 representative orthopedic surgeons. The exhibit of Henry H. Kessler, M.D., F.A.P.H.A., which won the Gold Medal Award, was on the "Cineplastic Operation," which deals with a special operation devised to utilize the remaining muscles in an amputation stump to activate an artificial hand. The exhibit consisted of photographs of cases, photographs of the operative procedure, and plaster models, as well as samples of the prosthesis. It also included motion pictures in color of the operation and the end results in several cases.

DR. GRIFFITH EVANS DEAD

THE London Letter of the *J.A.M.A.* for February 1, 1936, reports the death of Dr. Griffith Evans at the age of 100, at his home in Bangor, North Wales. Only a short time ago he celebrated his 100th birthday, at which time the late King George spoke to him by long distance telephone and offered his congratulations. Dr. Evans discovered the Trypanosoma Evansi, the first trypanosome recognized as the cause of a disease.

MOTHER'S DAY MAY 10

MOTHER'S DAY has taken on added significance during the past few years because of the movement to bring to the attention of the nation the needless waste of life of mothers in childbirth and to develop better maternity care.

A special effort is being launched for the sixth time this year through the Maternity Center Association with the keynote: "Early and Adequate Care Reduces the Risks of Motherhood: Father Plays a Leading Rôle."

NEW JERSEY FATHER CONVICTED FOR REFUSING SON'S IMMUNIZATION

THE refusal of a father to allow his 6 year old son to be immunized against diphtheria resulted, on January 28, in the assessment of a fine of $50 and a sentence of 30 days in jail, in the Juvenile Court of Newark, N. J. According to press reports quoting Charles V. Craster, M.D., D.P.H., City Health Officer, this is the first occasion on which this provision of the State Child Welfare Act has been used to compel children to receive diphtheria prevention treatment. This section of the Child Welfare Act of 1915 defines as neglect, ". . . the failure to prevent the performance of an act necessary to a child's physical welfare." The conviction was secured in spite of the fact that argument indicated that there was no law establishing that immunization was necessary to the child's welfare.

INDUSTRIAL HYGIENE LABORATORIES

ON January 1, 1936, the Industrial Hygiene Laboratories of the Chrysler Corporation began operation. These laboratories, located at the Dodge Main Plant of the Chrysler Corporation, in Detroit, are devoted to the study of occupational diseases and their sources, together with other agencies and conditions of work leading to industrial health hazards. The laboratories are under the direction of Dr. Stewart F. Meek, as industrial hygienist, with Dr. Gordon C. Harrold, as chemist. The laboratories have been planned under the direction of Carey P. McCord, M.D., F.A.P.H.A., who remains associated in the capacity of adviser and consultant.

BOOKS FOR PARENTS

FOR the tenth time in as many consecutive years The Parents' Magazine has made an award for the most helpful book of the year for parents. On February 17, publisher George J. Hecht presented the 1935 medal to Dr. Winifred E. Bain, Assistant Professor of Education of Teachers College, Columbia University, for *Parents Look at Modern Education*, published by D. Appleton-Century Company.

OPEN AIR CONGRESS

THERE has been announced for July 18–23, 1936, the Third International Open Air School Congress, to be held at Bielefeld and Hanover, Germany, shortly before the Olympic games at Berlin.

A bulletin of the International Committee on Open Air Schools can be obtained from the General Secretary of the Congress in Bielefeld or through the Assistant Commissioner of the Office of Education, Department of the Interior, Washington.

CATHARTIC TO MIX IN BREAD COSTS $600 FINE

A POWERFUL coal-tar cathartic has no proper place in bread or any other product sold as a food. The Food and Drug Administration regarded phenolphthalein as an adulterant when it was used as an ingredient of what the manufacturer called a "laxative health bread." The federal court at St. Louis, Mo., agreed with the food officials and imposed a $600 fine on the three members of the Bakers' Research Co. who had been selling "Owen's Viti-Veg" a mixture of flour, bran and between 10 and 12 per cent of phenolphthalein, a coal-tar cathartic. This mixture was recommended to bakers for addition to their regular bread mix. The product was to be marketed as "laxative health bread."

TESTIMONIAL DINNER FOR DR. WILLIAMS

ON January 22 the Baltimore City Medical Society, the School of Hygiene and Public Health of Johns Hopkins University, the Baltimore Association of Commerce and the Maryland Academy of Medicine and Surgery, united in a testimonial dinner at the Southern Hotel in Baltimore, to Dr. Huntington Williams, Commissioner of Health of Baltimore.

More than 200 physicians and others attended this dinner for which Dr. J. M. T. Finney, Sr., was toastmaster, and at which Hon. Howard W. Jackson, Mayor, Dr. Page Edmond for the Association of Commerce, and Dr. Allen W. Freeman for the School of Hygiene and Public Health, were speakers. Particular attention was paid to the fact that under Dr. Williams's administration the Department of Health has won the award for the largest population group in the 1934 City Health Conservation Contest, sponsored by the American Public Health Association in coöperation with the U. S. Chamber of Commerce.

HEART JOURNAL BECOMES MONTHLY

BEGINNING with the January, 1936, issue, the *American Heart Journal* is published monthly, instead of bimonthly as heretofore during the 10 years of its existence.

TUBERCULOSIS PREVENTORIUM FOR CHILDREN OPENED IN ARIZONA

A SCHOOL for children who are predisposed to tuberculosis has been opened in an abandoned Civilian Conservation Corps camp in the desert 15 miles from Tucson, Ariz. The school has been financed with WPA funds, the *New York Times* reported on January 20, and within 30 days will be caring for 150 boys and 212 girls, it is expected. Outdoor exercise, proper diet, rest, and health super-

vision will be combined with school studies. A large proportion of the children are from families of war veterans, it was stated.—*J.A.M.A.*, Feb. 8, 1936, p. 471.

NATIONAL HEALTH COUNCIL ELECTS OFFICERS

THE annual meeting of the National Health Council was held in New York on February 6.

Dr. Donald B. Armstrong was elected President of the Council, to succeed Colonel Theodore Roosevelt, who was relieved because of urgent and multiplying demands upon his time.

General officers elected are:

Vice-President—T. N. Pfeiffer, present incumbent.

Treasurer—Frederick Osborn, present incumbent.

Secretary—Professor Maurice A. Bigelow, of Columbia University.

Members of the Board of Directors elected are as follows:

R. M. Atwater, M.D., American Public Health Association; Colonel H. E. Bullis, National Committee for Mental Hygiene; L. H. Carris, National Society for the Prevention of Blindness; Dorothy Deming, R.N., National Organization for Public Health Nursing; Howard Green, National Committee of Health Council Executives; Kendall Emerson, M.D., National Tuberculosis Association; C. C. Little, Sc.D., American Society for the Control of Cancer; H. M. Marvin, M.D., American Heart Association; S. H. Osborn, M.D., Conference of State and Provincial Health Authorities of North America; William F. Snow, M.D., American Social Hygiene Association; F. N. Sperry, M.D., American Society for the Hard of Hearing.

At Large: George Baehr, M.D., New York Academy of Medicine; S. J. Crumbine, M.D., Formerly American Child Health Association; H. S. Cumming, M.D., U. S. Public Health Service; William DeKleine, M.D., American Red Cross; Louis I. Dublin, Ph.D., American Public Health Association; Livingston Farrand, M.D., President, Cornell University; Homer Folks, New York State Charities Aid Association; A. S. Knight, M.D., National Committee for Mental Hygiene; Colonel Theodore Roosevelt; Ray Lyman Wilbur, M.D., President, Stanford University.

CONFERENCE OF ILLINOIS HEALTH OFFICERS AND PUBLIC HEALTH NURSES

THESE were some of the outstanding thoughts expressed at the Annual Conference of Illinois Health Officers and Public Health Nurses which took place in Springfield, Ill., on December 10 and 11, with more than 500 delegates present:

Serum for the treatment of pneumonia (in appropriate cases) ought to be distributed free by every state department of public health. Immunization against scarlet fever with 5 doses of scarlet fever toxin is both effective and safe. Vaccine, properly prepared and preserved and given in sufficient dosage at the right time, should confer prolonged immunity against whooping cough in a high percentage of susceptible young children. When politicians or broken-down practitioners are employed as health officers there is no hope of providing the people in reasonable measure with the advantages and benefits of preventive medicine. Adequate and efficient public health service is a fine thing for good medical practitioners (as well as the public) but it is hard on the poor ones. School administrators must get it out of their minds that anyone can teach hygiene. A new philosophy concerning public health is taking root in the minds of governmental officials so that within the next 50 years public health work will be regarded as the first duty of government.

RED CROSS COURSES

American National Red Cross Teacher Training Courses for instructors in home hygiene and care of the

sick are held in coöperation with the following:

University of California at Los Angeles—June 27–August 7
Colorado State College, Fort Collins, Colo.—July 11–August 21
University of Minnesota, Minneapolis—June 15–July 26
Peabody College, Nashville, Tenn.—June 8–July 15
Pennsylvania State College, State College, Pa.—June 29–August 7
Syracuse University, Syracuse, N. Y.—July 8–August 14

All communications for information should be addressed to Public Health Nursing and Home Hygiene and Care of the Sick Service:

National Headquarters, American Red Cross, Washington, D. C. (for Eastern Area)
Midwestern Branch, American Red Cross, 1709 Washington Ave., St. Louis, Missouri (for Midwestern Area)
Pacific Branch, American Red Cross, Civic Auditorium, San Francisco, Calif. (for Pacific Area).

PERSONALS

ARTHUR W. HEDRICH, Sc.D., Fellow A.P.H.A., has been appointed Chief of the Vital Statistics Division of the Maryland State Department of Health. Dr. Hedrich has been for some years connected with the Biostatistics Department of the School of Hygiene and Public Health of Johns Hopkins University, Baltimore, Md., and will continue certain teaching in that institution. He fills the vacancy made by the appointment of John Collinson, M.D., D.P.H., F.A.P.H.A., to the position of Assistant Chief Statistician of the U. S. Bureau of the Census, Washington, D. C.

MILTON J. ROSENAU, M.D., F.A.P.H.A., who retired in 1935 as Professor of Preventive Medicine and Hygiene in the Harvard Medical School, Boston, has been appointed as of January 15, 1936, in charge of the Division of Public Health in the University of North Carolina School of Medicine, Chapel Hill. This division will coöperate with the State Board of Health, members of the executive staff of which will form part of the teaching staff.

MORLEY B. BECKETT, M.D., member A.P.H.A., has recently severed his connection with the Michigan State Department of Health in Lansing and become associated with the Kellogg Foundation.

LOUIS V. WALDRON, M.D., member A.P.H.A., has been appointed Commissioner of Health for the city of Yonkers, N. Y., to succeed Dr. William S. Coons, deceased. Dr. Coons served only a few weeks after his appointment in December, 1935.

V. K. VOLK, M.D., F.A.P.H.A., has recently been appointed Commissioner of Health and Medical Director of the County Contagious and Tuberculosis Hospitals in the Saginaw County Department of Health, Saginaw, Mich. Dr. Volk has recently been the Deputy Commissioner of Health of Pontiac, Mich. He began his new responsibilities on February 3.

JULIA GROSCOP, R.N., F.A.P.H.A., has been appointed Regional Public Health Nursing Consultant for the U. S. Public Health Service with offices at Chicago, Ill.

HAROLD S. DIEHL, M.D., member A.P.H.A., Professor and the head of the Department of Preventive Medicine and Public Health in the University of Minnesota Medical School and Graduate School, has recently been appointed Dean of the Medical Sciences.

ELMER V. MCCOLLUM, PH.D., Fellow A.P.H.A., Professor of Biochemistry and Head of the Department at Johns Hopkins University School of

Hygiene and Public Health, Baltimore, Md., has been presented with the Callahan Memorial Award by the Ohio State Dental Society, for his research in nutrition. The award is a gold medal given each year to a person "who has made a contribution to dental science which is of very exceptional value."

WILLIAM H. BRISTOW, of New Cumberland, Pa., has been appointed General Secretary of the National Congress of Parents and Teachers, with offices at 1201 Sixteenth Street, N.W., Washington, D. C.

FLORENCE FALLGATTER has been appointed as Chief of the Home Economics Education Service in the Vocational Home Economics Division, as announced by the Office of Education, U. S. Department of the Interior, Washington, D. C.

CHARLES W. FOLSOM, of Lafayette, Ga., member A.P.H.A., formerly Health Officer, Knox County, Ky., has been appointed to a similar position with the Walker-Catoosa County Health Department, Ga., succeeding Dr. Samuel P. Hall, Jr., who resigned.

ROBERT FRANK CARY, M.D., of Dawson, Ga., F.A.P.H.A., has been elected Health Officer of Terrell County.

HENRY GRADY CALLISON, M.D., of Augusta, Ga., F.A.P.H.A., has been named Health Commissioner of Augusta, and Dr. William A. Mulherin is Chairman of the Board.

DR. WILLIAM C. HUNSICKER has been appointed Director of Health of Philadelphia, and Dr. Alfred F. Allman, Assistant Director.

DOYLE E. HINTON, formerly Executive Secretary of the Delaware Anti-Tuberculosis Society, has been appointed to succeed Arthur J. Strawson as Executive Secretary of the Southern Worcester County Health Association at Worcester, Mass.

DR. IRMEL W. BROWN has been named Director of the Health Department of Kalamazoo, Mich., succeeding John L. Lavan, M.D., F.A.P.H.A., resigned.

WILLIAM H. PICKETT, M.D., of Saginaw, Mich., F.A.P.H.A., has resigned as Health Officer of Saginaw County, to accept a similar position in Florida.

CLARENCE COOK LITTLE, Sc.D., of Bar Harbor, Me., member A.P.H.A., Managing Director of the American Society for the Control of Cancer, has accepted the presidency of the American Birth Control League.

DR. ARCHIBALD BARKLIE COULTER has been appointed Director of the Bureau of Tuberculosis of the Health Department of the District of Columbia on a part-time basis. Dr. Coulter was recently named tuberculosis coördinator of the District.

DR. KARL V. QUINN, of Belchertown, Mass., has been appointed Assistant Commissioner of Mental Diseases for Massachusetts.

DR. SHERMAN S. FRAZIER, of Angola, Ind., has been appointed Secretary of the Angola City Board of Health, to succeed the late Dr. P. Norman Sutherland, who held the position for more than 25 years.

DR. ALVA L. SPINNING, of Covington, Ind., has been appointed Health Officer of Fountain County.

DR. WILLIAM BASIL KEELER, Medical Inspector for the South Boston Health Unit, has been appointed Health Commissioner of Boston, Mass., succeeding the late Dr. Francis X. Mahoney.

DR. HENRY T. DONOVAN has become the new Health Officer of Coffee County, Ala. The establishment

of the health unit in Coffee County makes a total of 57 health units, according to the press, in the State of Alabama, leaving but 10 counties without organized health service. This total of 57 represents a high record for Alabama, although by 1932, 54 counties had been organized. But during the depression 8 of these discontinued full-time service.

DR. JOHN CLIFTON, of Vermillion, Kans., has been appointed Health Officer of Marshall County, succeeding Dr. Charles E. Gaston, of Frankfort, resigned.

DEATHS

DR. JAMES S. WALTON, member A.P.H.A., District Health Officer of the New York State Health Department and former City Health Officer of Amsterdam, N. Y., died on February 19. He was 67 years old. Dr. Walton had practiced in Amsterdam for 35 years.

THEODORE F. FOSTER, M.D., member A.P.H.A., died on February 10. Until his illness a year ago he was Secretary of the Connecticut Public Health Association. Dr. Foster spent 2 years in Russia with the American Relief after the War and 3 years with the Tennessee State Health Department. He was a member of the Delta Omega.

DR. ADOLPH J. PISTOR, Chief of the Meat Inspection Division of the Bureau of Animal Industry, U. S. Department of Agriculture, died January 25, at the age of 59 years.

CONFERENCES AND DATES

Mar. 2–6, Twentieth Annual Session of the American College of Physicians, Detroit, Mich.

Mar. 25–28, American Society of Biological Chemistry, Washington, D. C.

Mar. 25–28, Federation of American Societies for Experimental Biology, Washington, D. C.

Mar. 25–28, American Society for Pharmacology and Experimental Therapeutics, Washington, D. C.

Mar. 29–Apr. 4, National Negro Health Week.

Apr. 1–3, Canadian Section of the American Water Works Association, Hotel Royal Connaught, Hamilton, Ont.

Apr. 8, Annual Meeting of the Massachusetts Tuberculosis League, Hotel Kimball, Springfield, Mass.

Apr. 9–10, American Association of Pathologists and Bacteriologists, Boston, Mass.

Apr. 9–11, American Association of Anatomists, Durham, N. C.

Apr. 15–18, American Physical Education Association Convention, Hotel Statler, St. Louis, Mo.

Apr. 22–25, National Tuberculosis Association, New Orleans, La. Meeting Headquarters, Municipal Auditorium; Residence Headquarters, Hotel Roosevelt.

Apr. 25–May 2, National Boys' and Girls' Week.

May 3–6, International Society for Crippled Children, St. Louis, Mo.

May 10, Mother's Day.

May 11–15, American Medical Association Convention, Kansas City, Mo.

May 11–15, 40th Annual Convention—National Congress of Parents and Teachers, Hotel Schroeder, Milwaukee, Wis.

May 14–16, American Water Works Association—Pacific Northwest Section, Aberdeen, Wash.

June 8–12, Annual Convention of American Water Works Association, Hotel Biltmore, Los Angeles, Calif.

June 10, Spring Meeting of the New York State Sewage Works Association, Lido Beach, L. I., N. Y.

June 21–26, Biennial Convention of the American Nurses' Association, the National League of Nursing Education, and the National Organization for Public Health Nursing, Los Angeles, Calif. Headquarters will be, respectively: A.N.A., and N.L.N.E., Ambassador Hotel; N.O.P.H.N., Biltmore Hotel.

June 22–25, Annual Meeting of the National Association of Master Plumbers, Buffalo, N. Y.

June 24–27, Seventh Annual Meeting, Western Branch, A.P.H.A.—meeting simultaneously with Canadian Public Health Association—Vancouver and Victoria, B. C.

July 6–11, The Royal Sanitary Institute, Southport, England.

July 18–23, Third International Open Air School Congress, Bielefeld and Hanover, Germany.

July 25–Aug. 1, The Second International Congress of Microbiology, London.

Sept. 8–10, International Union Against Tuberculosis, Lisbon, Portugal.

Oct. 12–17, The Dairy Industries Exposition, Atlantic City, N. J.

Oct. 19–22, Sixty-fifth Annual Meeting of the American Public Health Association, New Orleans, La. Meetings Headquarters, Municipal Auditorium; Residence Headquarters, Hotel Roosevelt.

Oct. 29-31, Annual Meeting of the Association of Military Surgeons, Detroit, Mich.

Nov. 9–12, Association of Dairy, Food and Drug Officials of the United States, Miami Biltmore Hotel, Coral Gables, Fla.

July 27–31, 1937 Second International Congress on Mental Hygiene, Paris.

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